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PUBLIC DOCUMENT

RECORD OF DECISION

Vasquez Boulevard/Interstate 70 Superfund Site

Operable Unit 1 Residential Soils

Environmental Protection Agency
Region 8

September 25, 2003

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RECORD OF DECISION
FOR
VASQUEZ BOULEVARD/I 70 SUPERFUND SITE
OPERABLE UNIT 1, RESIDENTIAL SOILS

CITY AND COUNTY OF DENVER, COLORADO

DECLARATION

Site Name and Location

The Vasquez Boulevard and I-70 (VB/I-70) Superfund Site (Site) is comprised of approximately 4.5 square miles, located in the north-central section of the City and County of Denver, Colorado. This document represents the Record of Decision (ROD) for the Operable Unit No. 1 (Residential Soils) remedial action. Operable Unit No. 1 (OU1) encompasses four neighborhoods in north-central Denver that are largely residential: Swansea, Elyria, Clayton, and Cole. OU1 also includes the southwest portion of the Globeville neighborhood and the northern portion of the Curtis Park Neighborhood.

Statement of Basis and Purpose

This decision document presents the Selected Remedy for OU1 of the VB/I-70 Site. The remedy selected in this ROD was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The decision is based on the Administrative Record file for OU1 of the Site. The U. S. Environmental Protection Agency's (U.S. EPA) CERCLIS identification number for the Site is CO0002259588.

This document is issued by the U.S. EPA Region 8 (EPA), the lead agency, and the Colorado Department of Public Health and Environment (CDPHE). Both U.S. EPA and CDPHE concur on the Selected Remedy presented herein. The remedial action selected in this Record of Decision is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances at the Site.

Assessment of Site

The VB/I-70 Site was placed on the National Priorities List (NPL) in 1999 due to arsenic and lead contamination of soil. For the purposes of investigations and remedy development, the Site was divided into three OUs. This Record of Decision is for OU1, Off-Facility (Residential) Soils of the VB/I-70 Site. There are approximately 4,000 residential properties, 10 schools, and 7 parks within OU1. Most residences are single-family dwellings. There are some multi-family homes and apartment buildings. EPA determined that the VB/I-70 Site is an Environmental Justice (EJ) Site because the residents are predominantly low income and minority. It is also disproportionately affected by environmental impacts from many sources including industry, other Superfund sites, and major transportation corridors.

Operable Units 2 and 3 address On-Facility soil and groundwater at the Omaha & Grant Smelter and Argo Smelter sites, respectively. The structures associated with both of these smelters have been demolished and the sites have been redeveloped with commercial businesses.

Because residential properties within the VB/I-70 Site contained concentrations of arsenic or lead at levels that could present unacceptable health risks to residents with short-term exposures, in September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action. The Action Memorandum required that soil be removed and replaced at any property where the average arsenic soil levels were greater than 450 ppm and/or lead soil levels were greater than 2000 ppm. These removal "action levels" were chosen to protect young children from adverse health effects related to short term (sub-chronic) exposure. To be conservative in meeting the action levels, a 5-point composite sample was collected from the front yard and a second 5-point composite sample was collected from the back yard of each property. Any property with one or more composite samples exceeding the action levels for either arsenic or lead was identified for soil removal.

EPA proposed the VB/I-70 Site for inclusion on the NPL in January 1999. EPA added the VB/I-70 Site to the NPL on July 22, 1999 (64 Fed. Reg. 39881, July 22, 1999).

The overall Remedial Action Objective (RAO) for OU1 of the Site is to protect human health. The following OU1 specific RAOs were developed for arsenic and lead in soil:

RAOs for Arsenic in Soil

1. For all residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in an excess lifetime cancer risk associated with ingestion of soil which exceeds 1×10^{-4}, using reasonable maximum exposure assumptions.

2. For all residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in a chronic or sub-chronic hazard quotient associated with ingestion of soil which exceeds 1, using reasonable maximum exposure assumptions.

3. For children with soil pica behavior who reside in the VB/I-70 Site, reduce the potential for exposures to arsenic in soil that result in acute effects.

RAO for Lead in Soil

4. Limit exposure to lead in soil such that no more than 5 percent of young children (72 months or younger) who live within the VB/I-70 Site are at risk for blood lead levels higher than 10 micrograms per deciliter (ug/dL) from such exposure. This provides 95% confidence that children exposed to lead in soil will be protected.

Description of Selected Remedy

Six alternatives were developed and evaluated to address the arsenic and lead contamination found at OU1 of the Site. Based on the Comparative Analysis of Alternatives, the remedy selected for OU1 of the

VB/I-70 Site is Alternative 6. The selected remedy consists of 3 components: a community health program; soil removal; and sampling.

The community health program consists of community and individual health education, a biomonitoring program to measure urinary arsenic levels and blood lead levels of children, and a response program that includes necessary follow-up environmental sampling, home investigation, and response. The program is composed of two separate, but overlapping, elements. The first element will address risks to area children from non-soil sources of lead. The second element will be designed to address children with soil pica behavior, to reduce their risks to arsenic in soil above 47 ppm, which is the preliminary action level determined in the Baseline Human Health Risk Assessment for children with soil pica behavior. Participation in one or both elements of the program will be strictly voluntary, and there will be no charge to eligible residents and property owners for any of the services offered by the community health program. The community health program will be implemented on an ongoing basis until the residential soil removal portion of this remedial action has been completed.

Soil removals will occur at properties that have lead or arsenic soil concentrations greater that 70 ppm arsenic or 400 ppm lead. The action level for lead is exceeded when the average lead concentration from three composite soil samples taken from the property is greater than 400 ppm. The action level for arsenic is exceeded when the highest arsenic concentration from three composite soil samples taken from the property is greater than 70 ppm. For properties where soil removal is conducted, all accessible soils will be removed to a depth of 12 inches. The excavation areas will be backfilled with clean soil, and pre-remediation yard features restored to the extent practicable, in consultation with the property owner. All excavated soils will be transported to an acceptable receiving facility, which may include the ASARCO Globe Plant. If the VB/I-70 soils are transported to the ASARCO Globe Plant, it will be used as capping and fill material in implementing the remedy at the Globe Plant Operable Unit. If the excavated soils cannot be placed on the ASARCO Globe Plant, then they will be transported to a local solid waste landfill where the soils may be used as daily cover material.

A program of on-going soil sampling will be implemented for lead and arsenic at all residential properties within the Site that have not already been adequately tested. This sampling program will continue through the completion of the soil removal portion of this remedy.

Statutory Determinations

The Selected Remedy meets the mandates of CERCLA § 121 and the National Contingency Plan. The remedy is protective of human health and the environment. It complies with all Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy for OU1 of the VB/I-70 Site does not satisfy the statutory preference for treatment as a principal element of the remedy because the large volumes of soils contaminated with low levels of lead and arsenic can not be treated cost effectively, and treatment was not acceptable to the community.

If VB/I-70 soils are disposed of at the ASARCO Globe Plant, a 5-Year Review will be required. If the soils are disposed of off-Site, this remedy will not result in hazardous pollutants remaining on-Site above levels that allow for unlimited use and unrestricted exposures, and a 5-Year Review will not be required.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can by found in the Administrative Record file for this Site.

- Contaminants of concern and their respective concentrations.
- Baseline risks represented by the contaminants of concern.
- How source materials constituting principal threats are addressed.
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment.
- Potential land use that will be available at the Site as a result of the Selected Remedy.
- Estimated capital, annual operating and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factors that led to selecting the remedy.

Authorizing Signatures

Max Dodson — Date
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region 8

Howard Roitman — Date
Director of Environmental Programs
Colorado Department of Public Health and Environment

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RECORD OF DECISION
FOR
VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE

1.0 DECISION SUMMARY

1.1 Site Name, Location, and Brief Description

The Vasquez Boulevard and I-70 (VB/I-70) Superfund Site (Site) comprises approximately 4.5 square miles, located in the north-central section of the City and County of Denver, Colorado. The U.S. EPA CERCLIS identification number for the VB/I-70 site is CO0002259588.

The VB/I-70 Site was placed on the NPL due to metals contamination associated with historic smelter operations. The primary contaminants of concern are lead and arsenic. Subsequent investigations indicate that arsenic contamination may also be due to application of lawn care products. For the purposes of investigations and remedy development, the site was segregated into three operable units (OUs). This Record of Decision (ROD) is for Operable Unit 1 (OU1), Off-Facility (Residential) Soils of the VB/I-70 Site. Operable Units 2 and 3 address On-Facility soils and groundwater at the Omaha & Grant Smelter and Argo Smelter sites, respectively. The structures associated with both of these smelters have been demolished and the sites have been redeveloped with commercial businesses.

OU1 encompasses four neighborhoods in north-central Denver that are largely residential: Swansea, Elyria, Clayton, and Cole. OU1 also includes the southwest portion of the Globeville neighborhood and the northern portion of the Curtis Park Neighborhood. Figure 1 is a map of the area. There are approximately 4,000 residential properties, 10 schools, and 7 parks within OU1. Most residences are single family dwellings. There are some multi-family homes and apartment buildings. While numerous commercial and industrial properties are also located within the Site, the levels of arsenic and lead at these properties do not appear to pose an unacceptable risk to workers in a commercial/industrial scenario based on the limited sampling that was performed.

EPA is the lead agency for this action. The Colorado Department of Public Health and Environment (CDPHE) is the support agency. It is anticipated that the clean up will be funded by EPA and CDPHE.

1.1.1 <u>Environmental Justice Considerations</u>

EPA determined that the VB/I-70 Site is an Environmental Justice (EJ) site because the residents are predominantly low income and minority. It is also disproportionately affected by environmental impacts from many sources including industry, other Superfund sites, and major transportation corridors.

According to the 2000 census, the total population living within OU1 is 17,545, including approximately 2,400 children 6 years old or younger. A higher percentage of people who identify themselves as minorities reside in VB/I-70 OU1 compared to the Denver city-wide average, and average household

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COCs	Contaminant of Concern
CT	Central Tendency
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
FS	Feasibility Study
GRA	General Response Action
IEUBK	Integrated Exposure, Uptake, and Biokinetic Model
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
USEPA	United States Environmental Protection Agency
VB/I-70	Vasquez Boulevard and I-70

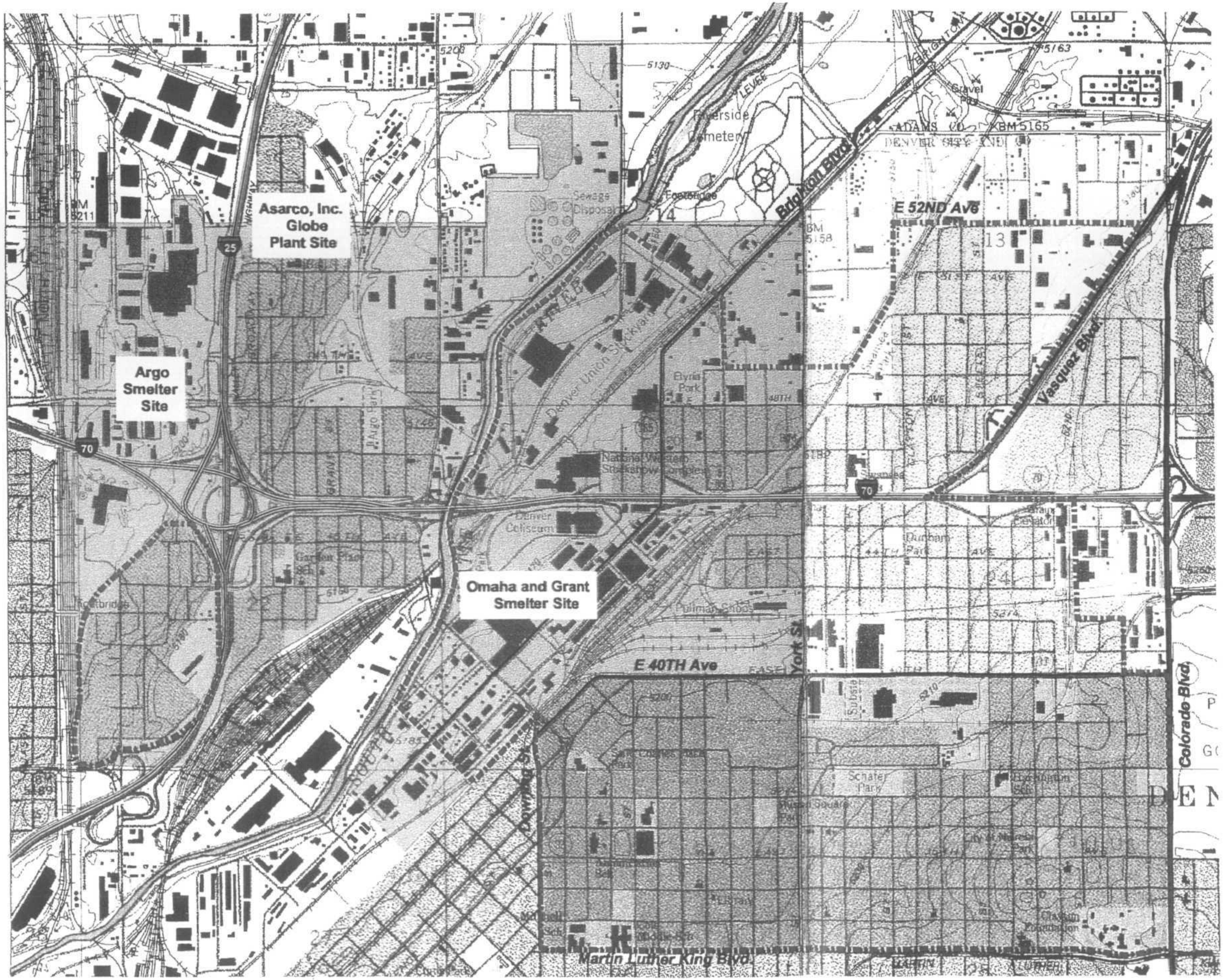
incomes are lower in the VB/I-70 community than the average income for households in Denver city-wide. Table 1 summarizes key demographic data by neighborhood.

Figure 1

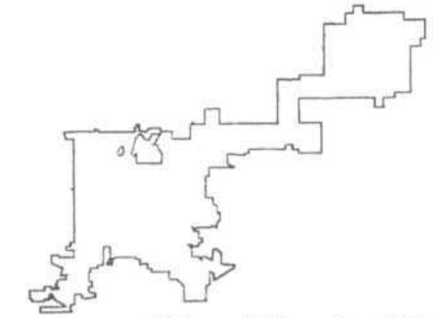
Color Map(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.



Location of VB/I-70 Site



City and County of Denver

Washington

Legend

Study Area Boundary

Stream or River

Neighborhood

CLAYTON

COLE

ELYRIA

GLOBEVILLE

SWANSEA

Map Base:

USGS 7.5' Quadrangle

Commerce City

1,000 500 0 1,000 2,000

Feet

200 100 0 200 400 600

Meters

Vasquez Boulevard / I-70
Operable Unit 1
Remedial Investigation Report

Figure 1

Site Location

Project No: RAC 68-W7-0039 WA 004-RICO-089R

File: Q:\4994\1004\RI-FS\vbi70_site.eps

Table 1
Demographic and Economic Indicators for the Neighborhoods of VB/I-70

	Clayton	Cole	Swansea-Elyria	Globeville	Denver
Total Population	5,172	5,662	6,708	3,454	560,663
# Children under 18	1,901	1,936	2,491	1,162	129,457
# Elderly 65+	432	406	437	227	59,262
% African American	38.9%	21.3%	5.3%	2.6%	10.8%
% Native American	0.6%	0.6%	0.7%	1%	0.7%
% Asian/Pacific Islander	2.1%	0.3%	0.3%	0.8%	2.8%
% Latino	50.2%	71.0%	83.0%	77.5%	31.7%
% Non-Latino White	6.0%	6.0%	9.9%	17%	51.9%
% Persons on Public Assistance	12.2%	12.3%	7.9%	3.8%	4.6%
% Persons in Poverty	28.5%	26.3%	27.9%	23.2%	14.3%
Ave Household Income	$44,122	$38,990	$38,435	$33,148	$55,087

1.2 Site History and Enforcement Activities

This section provides a summary of the history and enforcement activities related to OU1 of the VB/I-70 Site. Since the VB/I-70 Site came to the attention of EPA following studies directed by CDPHE at the adjacent ASARCO Globe Site (CERCLIS ID # COD007063530), a short summary of how these studies lead to the discovery of the VB/I-70 Site is included.

1.2.1 <u>The ASARCO Globe Site</u>

EPA proposed the ASARCO Globe Site be included on the NPL in May 1993. The ASARCO Globe Site had been used for the smelting and refining of metals and metal based chemicals. In July 1993, the State and ASARCO Incorporated entered into a consent decree to resolve a suit under CERCLA filed by the State of Colorado. As part of that settlement agreement, ASARCO was required to remediate soils in residential properties surrounding the Globe Plant where levels of cadmium, lead, and/or arsenic exceed acceptable limits established by the State in a Record of Decision. The State of Colorado has been the lead agency for overseeing the cleanup activities on the plant site and in the Globeville neighborhood.

The consent decree required ASARCO to collect soil samples from residential yards in the Globeville neighborhood and continue remediation until the extent of contamination from the Globe Plant was established. In conducting the investigation, ASARCO continued to find random occurrences of elevated levels of arsenic in residential yards at greater distances from the Globe plant site

CDPHE continued to be concerned about the possible health risks to area residents potentially exposed to arsenic in yard soils and about the extent of the problem in the north Denver area. In 1997, CDPHE began a limited soil sampling program in the Elyria and Swansea neighborhoods, located just east of Globeville, across the South Platte River. Figure 1 shows the relative locations of Globeville, Swansea, and Elyria. CDPHE collected soil samples from 25 homes. The results are summarized in Table 2.

Table 2

Yard Average Concentrations
Measured in Elyria and Swansea Properties

	# homes sampled	minimum	maximum
arsenic	25	below detection	1800 ppm
lead	25	39 ppm	754 ppm

These results indicated that high concentrations of arsenic in soil extended far beyond the Globeville neighborhood. Since it was unclear how long the dispute resolution process with ASARCO would take, CDPHE requested EPA's assistance in immediately responding to the elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods.

1.2.2 The Vasquez Boulevard/I-70 Site

In 1998, EPA's first action at the Site was to mobilize an Emergency Response team to direct an extensive soil sampling effort and time critical removal actions for the houses posing immediate health risks to local residents.

The Emergency Response consisted of two phases. Phase I was an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties which were potential time critical removal candidates (remove and replace soil).

The boundaries of the Phase I sampling program were established as East 38th Avenue on the south, East 56th Avenue on the north, Colorado and Vasquez Boulevards on the east and the South Platte River on the west, and included the southwest portion of Globeville, the only area of Globeville not yet characterized by ASARCO.

Phase I sampling occurred during March and April 1998. A minimum of three grab samples were collected from each property where EPA obtained access, two samples from the surface and one from the subsurface. Soil samples were also collected from all schools and parks located within the initial study area. Samples were collected from locations judged to present a high potential for exposure relative to other areas of the property (for example, at bare spots within the yard) and were analyzed for arsenic, lead, cadmium and zinc.

In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action. The Action Memorandum required that soil be removed and replaced at any property with an average arsenic soil level greater than 450 ppm and/or lead soil levels greater than 2000 ppm. These removal "action levels" were chosen to protect young children from adverse health effects related to short-term (sub-chronic) exposure. From the Phase I data, 37 properties were identified as potentially requiring time critical removal action. The Phase II sampling occurred in July and August 1998. Additional soil samples were collected from any residential property that had a maximum surface soil concentration equal to or greater than 450 ppm for arsenic or 2000 ppm for lead, i.e., the removal action candidates. These residential properties were revisited and a 5-point composite sample was collected from the front yard and a second 5-point composite sample was collected from the back yard of each. Arsenic and lead levels in these samples were measured. Any property with one or more composite samples exceeding the removal action levels for either arsenic or lead was identified for soil removal. Also in Phase II, the On Scene Coordinator extended the Site boundaries south to East 35th Avenue, encompassing a greater portion of the Cole and Clayton neighborhoods. Properties not sampled during Phase I were targeted for screening level sampling using the Phase I protocols. In all, 1,393 properties were sampled as part of the Phase I and II programs. Twenty-one additional properties were identified for time critical removal actions as a result of the Phase II sampling event. Removals were completed at 18 of these properties where EPA obtained access. The schools and parks sampled had very low levels of arsenic and lead and did not require removal and replacement of their soil.

Based on the results of the Phase I and Phase II sampling programs, EPA determined that residential properties within the VB/I-70 Site contained concentrations of arsenic or lead at levels that could present unacceptable health risks to residents with long term exposures. On this basis, the EPA proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for long-term response, EPA began Phase III remedial investigation activities in August 1998 as removal activities were underway.

During the public comment period on the proposed NPL listing of the VB/I-70 Site, ASARCO submitted information indicating that the source of the arsenic in residential soil may be lawn care products that were readily available for residential use in the Rocky Mountain Region and elsewhere in the west in the 1950s and 1960s. These products were legally formulated with arsenic trioxide and lead arsenate to be effective in controlling crabgrass. The specific product identified by ASARCO was "PAX 3- year Crabgrass Control," available from the 1950's until the early 1970's, and formulated with 27% arsenic trioxide and 8% lead arsenic oxide. The product is no longer available commercially.

I am not comfortable w/ the level of detail in this section.

The Phase III remedial investigation activities were focused on collecting all the information necessary to accurately characterize exposure and risk to residents at the VB/I-70 site to support a quantitative baseline human health risk assessment. Secondly, efforts began to investigate the source of the arsenic and lead in residential soils. Toward that end, EPA used its CERCLA Section 104(e) information gathering authority to acquire a 6-ounce sample of the "PAX 3-year Crabgrass Control" product from Martin Resources, a company that acquired the company that had manufactured PAX. Tests on the PAX sample formulation provided by Martin Resources were helpful to EPA, but by themselves proved inconclusive to determine whether all arsenic and lead found in the VB/I-70 residential soils were from pesticides or smelter emissions, or both. ~~However, information from other studies combined with the tests on the PAX sample in a weight of evidence evaluation indicate a high likelihood that the source of arsenic in VB/I-70 residential soils is lawn care products formulated with arsenic.~~

Need less detail here

On March 6, 2003, EPA issued an Action Memorandum that established the basis for conducting a non-time critical removal action. The Action Memorandum required that soil be removed and replaced at any property that had an arsenic soil level greater than 240 ppm and/or lead soil levels greater than 540 ppm based on the Phase III sampling results. These "action levels" were chosen to address the properties that present the highest risk of adverse health effects to children and adult residents. From the Phase II sampling results, 143 properties were identified as requiring a non-time critical removal action. This removal action is scheduled to be completed in the Fall of 2003.

1.2.3 Enforcement Activities

EPA Region 8 conducted a PRP Search for the Site to identify the current property owners and past owners and operators. EPA identified ASARCO Incorporated as the primary operator of 2 of the 3 smelters historically located in the general area of the VB/I-70 Site - the Globe Smelter and the Omaha & Grant Smelter. The City and County of Denver was also identified as a current owner and a past owner/operator of most of the property located within OU2 of the Site. Other current owners or past owner/operators of most of the property located within OU2 of the Site include Pepsi Bottling Group, Union Pacific Railroad, and the Forney Museum. ASARCO, the City and County of Denver, Pepsi and Union Pacific all received and responded to CERCLA Section 104(e) information requests.

Preliminary information gathered to date indicates that only ASARCO may be liable for the lead contamination found in OU1 of the Site. However, ASARCO has argued that the arsenic requiring remediation came from sources other than smelter emissions, and ASARCO may therefore be liable for a small portion of the costs associated with the arsenic contamination found at OU1 of the Site. The Region did not issue an Order to ASARCO to perform the cleanup of OU1 of the Site. This decision was based on the liability arguments and on ASARCO's competing environmental and financial obligations for sites nationwide where ASARCO is a PRP.

1.3 Community Participation

Due to the high degree of public interest, the large population impacted by OU1, and the cultural differences among the communities, community involvement was expanded to provide for extensive public input throughout the Remedial Investigation and Feasibility Study and Remedy Selection process. Expanded public involvement included development of a Community Involvement Plan, establishment of a stakeholders working group, providing a technical assistance grant, and additional public meetings and fact sheet mailings. A summary of each of these activities is included in this section.

In August 1998, EPA formed a Working Group of stakeholders to provide an open forum for discussing all technical aspects of EPA's investigation, including the risk assessment and eventual cleanup alternatives. The Working Group addressed the Environmental Justice concern of having the community participate in decision making by providing direct access to decision makers. Through the Working Group, data and issues were discussed, allowing for community input into decision making throughout the development and implementation of the remedial investigations, risk assessment, feasibility study, and remedial alternatives. The Working Group met monthly since August 1998. EPA also provided Site updates at neighborhood association meetings periodically during the Remedial Investigation/Feasibility Study.

The stakeholders attending the working group meetings include representatives from all parties that have an interest in OU1 of the VB/I-70 Site. The Working Group is comprised of representatives of the City and County of Denver; CDPHE; the Agency for Toxic Substances and Disease Registry (ATSDR); ASARCO; and the Clayton, Elyria, and Swansea Environmental Coalition (CEASE), the recipient of a Technical Assistance Grant from EPA. Stakeholders also included other representatives from the four Denver low income neighborhoods included in OU1. Each neighborhood has its own unique ethnic and racial characteristics; two are predominately Hispanic, and two are mixed Hispanic and African-American.

The VB/I-70 site has been of interest to local, State and Federal elected officials including the Mayor of Denver, City Council members, State legislators, Congresswoman Diana DeGette and Senator Wayne Allard. These officials or their representatives were invited and often attended Working Group meetings. In addition, individual briefings were provided to these officials or their respective staffs.

Since much of the population living within the Site boundaries is Spanish speaking, outreach materials including the proposed plan, fact sheets, and flyers were translated into Spanish. Public notices were translated into Spanish as well and published in local Spanish newspapers. For major public meetings and workshops, simultaneous translations were provided so that all participants could understand the presentations and ask questions. For small group meetings, the translator sat with those who spoke only Spanish.

The following fact sheets and fliers were prepared and mailed to the community:

DATE	DESCRIPTION
February 1999	Fact Sheet #1 Public Comment Period Begins on the Proposed NPL
April 1999	Fact Sheet #2 Some Facts About Soil Sampling
June 1999	Fact Sheet #3 Why is the EPA in Cole & Clayton
September 1999	Fact Sheet #4 Learn More about Risk Assessment
September 2000	Fact Sheet #5 Risk Assessment for the VBI70 Site
October 2000	Fact Sheet #6 Soil Sampling Results
May 2001	Fact Sheet #7 Neighborhood Update on Arsenic and Lead in Soil
March 2003	Update Arsenic and Lead Cleanup in Your Neighborhood
No date	General Arsenic Fact Sheet for VB/I-70
No date	General Lead Fact Sheet for VB/I-70

In addition to the working group meetings, the following public meetings were held:

DATE	DESCRIPTION
July 16, 1998	Availability Session on Soil Sampling and Cleanup
September 1, 1998	Meeting to Discuss Removal Process
September 25, 1998	Informational Meeting on Soil Sampling and Cleanup
October 8, 1998	Informational Meeting on Soil Sampling Cleanup
March 10, 1999	Public Meeting on NPL Proposal
September 22, 1999	Open House on the Risk Assessment
September 28, 1999	Open House on the Risk Assessment
February 22, 2000	Public Meeting on Soil Sampling Results
September 26, 2000	Public Meeting on Soil Sampling and Cleanup
September 27, 2000	Public Meeting on Soil Sampling and Cleanup
June 20, 2002	Public Meeting on Proposed Plan
June 22, 2002	Public Meeting on Proposed Plan
June 29, 2002	Public Meeting on Proposed Plan
June 19, 2003	Public Meeting on Revised Proposed Plan
June 21, 2003	Public Meeting on Revised Proposed Plan

In addition to publishing the fact sheets and conducting the meetings, EPA has made the VB/I-70 administrative record available to the public at three repositories located within the Site boundaries as well as the EPA's Region 8 Superfund Records Center.

1.4 Scope and Role of Operable Unit

In order to manage the Site effectively, the remedial program organized the VB/I-70 Site into 3 operable units (OUs). Separate investigations have been or are being conducted, and separate remedies will be selected for each OU. The OUs are:

Operable Unit 1 (OU1) is defined as residential yards within the study area with levels of lead or arsenic in soil that present an unacceptable risk to human health. EPA's highest priority at VB/I-70 Site is OU1 because there is the highest potential for human exposure in the residential yards. EPA is the lead agency for remedial response activities at OU1, and response activities have been and will be financed by the Superfund.

Operable Unit 2 (OU2) is defined as the location of the former Omaha & Grant Smelter and includes all environmental media impacted by releases of hazardous substances that resulted from the operation of that smelter. This is EPA's second priority for VB/I-70 since the Omaha & Grant Smelter was located historically on the property now home to the Denver Coliseum and other businesses. The majority of the OU2 area is paved and has been extensively redeveloped since the smelter stopped operating. Contamination is likely limited to subsurface and groundwater impacts.

Operable Unit 3 (OU3) is defined as the location of the former Argo Smelter and includes all environmental media impacted by releases of hazardous substances from that smelter. OU3 is

EPA's third priority in the VB/I-70 Site. EPA will be the lead agency for remedial response activities at OU3 and it is expected that response activities will be financed by the Superfund.

Each operable unit has a unique physical location and historic operation. Thus, actions taken at one operable unit can be taken independently of actions at other portions of the Site, or can be taken in conjunction with each other, if appropriate. This is the first record of decision for the VB/I-70 Site.

There have been several removal actions taken at OU1. These actions have been taken to address residential yards that pose the highest potential human health risk due to elevated levels of arsenic and lead. This Record of Decision selects the long-term clean up approach for residential soils and selects soil clean up levels for lead and arsenic.

1.5 Site Characteristics

OU1 of the VB/I-70 Site encompasses 4.5 square miles in north-central Denver that are largely residential. OU1 includes the Denver neighborhoods of Swansea, Elyria, Clayton, Cole, southwest portion of Globeville, the northern portion of the Curtis Park. OU1 is narrowly defined as only those residential yards within the site boundaries with levels of lead or arsenic in soil present at concentrations greater than the cleanup levels established in this Record of Decision. While numerous commercial and industrial properties are also located with OU1, these properties are not considered to be part of the OU-1 of the VB/I-70 Site. The only commercial properties considered to be included in the VB/I-70 site are those properties included in Operable Units 2 and 3.

The Remedial Investigation was performed to further support the baseline risk assessment and remedial risk management decisions. The data from Removal Investigations Phases I and II were judged to be too limited to be the basis of broader remedial decisions. More specifically, many samples had elevated detection limits for arsenic, the sampling density at each property was too low, and/or sampling locations were not clearly identified. Three investigations were performed between 1998 and 2000 in support of the Remedial Investigation. These investigations were:

- Physico-Chemical Characterization Study.
- Residential Risk Based Sampling Investigation.
- Phase III Field Investigation.

Data generated from these investigations are reported in the Remedial Investigation report. The key findings are as follows:

- Arsenic and lead are the contaminants of concern in residential soils.
- Generally, concentrations of arsenic and lead are highest in the first two inches of soil and decrease with depth.
- The majority of properties have low levels of arsenic. Thirty-one percent of the properties have the 95%

upper confidence of the mean being either below the method detection limit of 11 ppm or near the method detection limit.

- Ninety-one percent of the properties contain mean lead concentrations below the EPA screening level for lead in soil of 400 ppm.
- The most frequently observed property mean concentrations of lead are in the range of 100 -150 ppm.
- Levels of arsenic in the bulk versus fine soil fractions are nearly equal, while lead is slightly higher in the fine fraction.
- Concentrations of arsenic and lead in indoor dust and garden vegetables remain relatively consistent over a wide range of yard soil concentrations.
- Mean arsenic concentrations in surface soils at school and parks range from below the method detection limit of 11 ppm to 26 ppm. The mean lead concentrations range from 67 ppm to 256 ppm.
- The average background levels of arsenic ranges from 8 ppm to 15 ppm.
- The mean background level of lead in soil is approximately 195 ppm.
- The sources of elevated levels of lead and arsenic in residential soils are likely a combination of historic smelter smokestack emissions, lawn care products, and other industrial sources.
- Lead paint was detected at most locations where paint was sampled. The data suggests that interior and/or exterior leaded paint might be a source of lead exposure in area children, either directly (by paint chip ingestion), or indirectly (by ingestion of dust or soil containing paint chips).

The remainder of this section provides a summary of the purpose, design and results of the studies conducted as part of the Remedial Investigation.

1.5.1 <u>Physico-Chemical Characterization Study and the Residential Risk Based Sampling Investigation</u>

The Physico-Chemical Characterization Study, implemented in August 1998, conducted analyses on existing Phase I and Phase II soil samples to generate supplementary data on the relationship between:

- concentrations of metals in the bulk and fine soil fractions,
- the chemical forms of arsenic and lead (speciation),
- particle sizes, and
- the *in vitro* bioaccessibility of arsenic and lead in site soils.

The Residential Risk Based Sampling Program was conducted prior to soil excavation at properties planned for time critical removal action. The selected properties were intensively sampled by collecting 150 - 200 individual samples in the yards. Yards adjacent to the selected properties were also sampled to determine if there is a limit to the contamination at the property boundary. The program also included:

- collection of indoor household dust,
- collection of attic dust,
- collection of tap water,
- analysis of exterior and interior paint, and
- collection of garden vegetables and garden soils.

In addition, EPA established a voluntary biomonitoring service for all families whose yards were undergoing the removal actions. Any family member could have hair or urine tested for arsenic levels and/or blood lead levels tested.

The Physico-Chemical Characterization Study and the Risk Based Sampling Program generated these important findings:

- Nearly all the arsenic mass in soils is present as arsenic trioxide with a contribution from lead arsenic oxide.
- Lead occurs in several phases, including lead arsenic oxide, lead phosphate, and lead manganese oxide, which indicates that the source of lead is different from the source of arsenic.
- Concentrations of metals are about 10%-20% higher in the fine fraction of soil compared to the bulk fraction.
- Arsenic bearing particles are predominantly small-sized, between <5 and 49 micrometers (um).
- The majority of lead bearing particles are also small, between <5 um and 49 um, although lead is consistently found in particles between 50 um and 149 um in size.
- The relative percent bioaccessibility ranges between 3% and 26% for arsenic and 64% and 83% for lead.
- There does not appear to be a significant contribution from outdoor soils to the levels of arsenic and lead in indoor dust.
- Lead was detected in paint at most locations where paint was sampled, with 130 out of 144 samples having values above 1 mg/cm^2. These data suggest that interior and/or exterior leaded paint might be a source of lead exposure in area children, either directly (by paint chip ingestion), or indirectly (by ingestion of dust or soil containing paint chips).
- The intensive soil sampling revealed that at properties with the highest concentrations of arsenic and lead, the contamination is distributed across the yard area, with a fairly clear boundary between the affected property and the adjacent property. Also, metals concentrations are highest in the first two inches of soil and decrease with depth.
- The *in-vitro* bioaccessibility results indicated that animal studies to investigate the relative bioavailability of lead and arsenic in soils at VB/I-70 OU1 were warranted.
- The biomonitoring results indicated that all blood lead results were below the benchmark value of 10 ug/dL, arsenic was not detected in any sample of urine, and arsenic was below the level of detection in 14 of 15 hair samples. In the one sample which was detected, the concentration (0.41 ug/g) was within the normal range.

1.5.2 The Phase III Remedial Investigation

The overall objectives of the Phase III Remedial Investigation were to:

1. Collect sufficient data to support a quantitative baseline human health risk assessment which would provide the basis for risk management decisions, and
2. Collect sufficient data to define the nature and extent of contamination.

The Phase III investigation was designed specifically to support quantitative risk calculations. Thus, the design of the Phase III investigation began with the development of the Site conceptual model, identification of important exposure pathways, and selection of contaminants of concern.

1.5.2.1 *Selection of Chemicals of Concern*

Data collected during Phase I and Phase II clearly indicated that arsenic and lead were both contaminants of potential concern at the VB/I-70 Site. However, no systematic evaluation had been performed to determine whether or not any other contaminants might also be of potential concern. A careful review of available data was undertaken to determine if other contaminants should be considered as contaminants of concern. The review followed EPA guidance contained in "Risk Assessment Guidance for Superfund: Human Health Evaluation Manual (Part A)" (EPA 1989). Based on the review, the contaminants of concern identified for quantitative evaluation at OU1 are arsenic and lead. All other contaminants detected in soils in OU1 are either not of concern or are present at levels that contribute minimal risk compared to arsenic and lead.

1.5.2.2 *Development of the Site Conceptual Model*

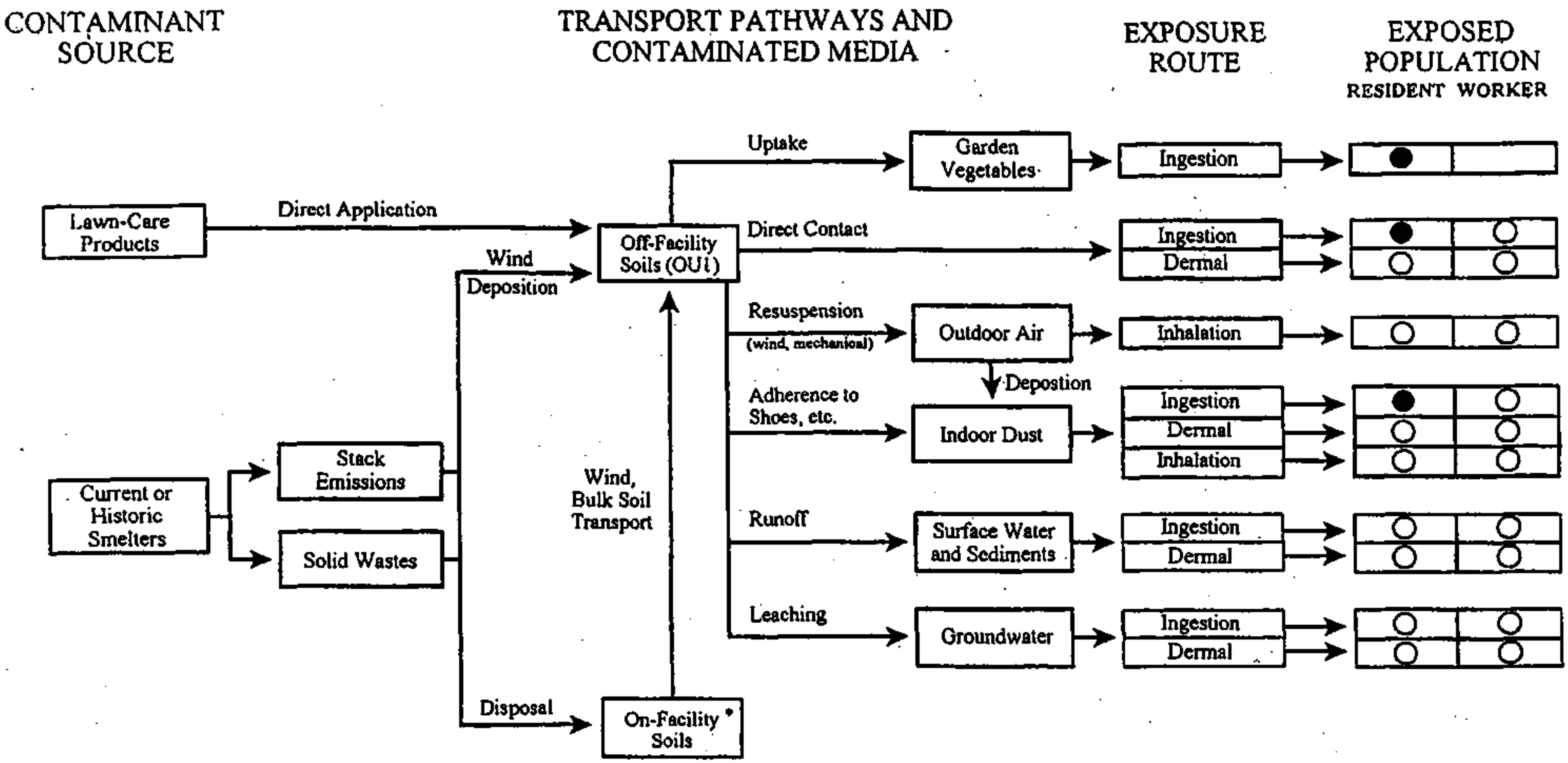
A Site Conceptual Model for OU1 showing the potential sources, release mechanisms, and main pathways by which contaminants in surface soil may come into contact with area residents was developed and is shown in Figure 2. The Site Conceptual Model for OU1 organized the available information about arsenic and lead in soils. It also was used for identifying information needs to allow quantitative analysis of the

complete the paragraph,

(found on p. 15)

Figure 2

FIGURE 2 CONCEPTUAL SITE MODEL FOR OPERABLE UNIT 1 EXPOSURES TO OFF-FACILITY SOILS



= Pathway is not complete

= Pathway is or might be complete, but is judged to be minor; qualitative evaluation

= Pathway is or might be complete and could be significant; quantitative evaluation

* To be evaluated as a separate operable unit.

exposure and health risk associated with the important exposure pathways. The conceptual model identified exposure pathways judged to be of sufficient potential concern to warrant quantitative exposure and risk analysis. The significant exposure pathways identified in the conceptual model were ingestion of garden vegetables, soils, and dust by Site residents. The Phase III field investigation was then designed to collect sufficient data to quantify the risks associated with each significant exposure pathway.

1.5.2.3 Exposure Pathway Data Requirements

The Phase III investigation consisted of six primary activities:

1. Sampling surface soils (0"-2") in residential yards throughout the study area,
2. Sampling indoor dust in homes,
3. Sampling vegetables and surface soils (0"-6") from residential vegetable gardens,
4. Analyzing the concentration of arsenic and lead in the fine fraction of soil,
5. Analyzing the concentration of arsenic and lead in surface soil from all schools and parks within the study area, and
6. Animal studies on the relative bioavailability (RBA) of arsenic and lead in Site soils.

In the Phase III field investigation, the properties targeted for soil sampling included all residential properties within the study area boundaries that had not been sampled as part of the Phase I and Phase II programs, as well as re-sampling of all the properties that had been sampled in Phase I and Phase II. The study area expanded from that in Phase I and II to include whole neighborhoods, and not fractions thereof. A total of 4000 residential properties were targeted for sampling in the 4.5 square mile expanded study area.

1.5.2.4 Sampling Strategy and Bioavailability Study

EPA designed the Phase III residential soil sampling program to meet or exceed data quality objectives for baseline risk assessments. At OU1, a residential property was assumed to require remedial action unless there was at least 95% confidence that no action is required.

For arsenic, the data quality objective was met by using the 95% Upper Confidence Limit (UCL) of the arithmetic mean concentration of arsenic in soil at the property as the exposure point concentration (EPC) in the baseline risk assessment, and as the basis for remedial decision making. That is, if the health risks associated with exposure to the 95% UCL are acceptable, there is at least 95% confidence that the true arithmetic mean of arsenic for the property is below this level and that risks are within acceptable limits.

For lead, the data quality objectives were met by using the EPA IEUBK model that describes the probability that an individual exposed to a specified set of environmental lead levels will have a blood lead value that is above a level of health concern. An acceptable level of lead in soil is defined as the arithmetic mean soil concentration within a yard such that a typical child or group of similarly exposed children would have a predicted risk of no more than 5% of exceeding a blood lead level of 10 micrograms per deciliter (ug/dL). This provides 95% confidence that children exposed to lead in soil will be protected.

The key design elements of the soil sampling component of the Phase III project are as summarized below.

<u>*Sampling Depth*</u>

Available data on lead and arsenic levels in residential soils were sufficient to establish that concentrations of contaminants in subsurface soil are lower than in the surface soil. Thus, Phase III was designed to characterize only surficial soil (0"-2" interval) in residential yards.

<u>*Calculation of the 95% UCL*</u>

Currently, USEPA has established default methods for calculating the 95% UCL for distributions that are either normal or lognormal (EPA 1992). Equations for calculating the 95% UCL of the mean for distributions other than the normal and the lognormal are not readily available.

Data from residential properties that were intensively sampled suggest the distribution of arsenic values within a residential property is not well characterized as either normal or lognormal. Therefore, use of EPA's default equations as the basis for calculating the 95% UCL based on a series of grab samples might yield results that are not accurate.

One way to minimize problems associated with calculating the 95% UCL of the mean for non-standard distributions is by combining individual samples into composite samples. This approach is taken because, regardless of the shape of the parent distribution, the distribution of the values of composite samples will approach a normal distribution if the number of sub-samples is sufficiently large and the sub-samples are thoroughly mixed. This approach supports the use of EPA's recommended equation for calculation of the 95% UCL of the mean at a property. In addition, the variability between composite samples is less than between grab samples, so uncertainty in the mean of composite samples is usually less than for an equal number of grab samples. For these reasons, the Phase III soil sampling program utilized compositing of grab samples collected within a property.

<u>*Number of Composites per Property*</u>

The design of the Phase III program required the collection of 3 composite soil samples of 10 sub-samples at each property. This design achieved an appropriate balance of cost and minimization of the false positive rate. The Phase III Project Plan specified that 30 sub-samples be located approximately equidistant throughout each property. Each composite contained 10 sub-samples representing an independent estimate of the yard-wide mean. All surface soil locations were collected from the top 0-2" interval. In areas of dense sod, the sod layer was carefully lifted and the soil immediately beneath the sod was sampled. A subset of samples was sieved through a 250um screen to isolate the "fine" fraction of the soil for subsequent land and arsenic analysis.

The proposed composite soil sampling approach was optimal for characterizing the yard wide average concentrations of arsenic and lead. However, there were concerns that the composite samples might dilute hot spots within a yard. So a method to statistically predict hot spots using the composite results was developed. In order to be protective, EPA had to ensure that the predicted value was more likely to overestimate than underestimate the true value of a potential hot spot. At yards where unacceptable short term risk was indicated, 30 individual grab samples would be collected to characterize hot spots.

Dust Sampling

As part of Phase III, EPA collected house dust samples to define the relationship between arsenic and lead levels in soil and dust at this Site. Seventy-five properties were selected for this study. These properties were chosen by stratifying the soil concentrations and randomly selecting an equal number of properties with low, medium, and high concentrations in soil and also equal spatial representativeness across the Site.

Garden Soil and Vegetable Sampling

Another pathway by which residents might be exposed to soil-related contaminants is ingestion of vegetables grown in home gardens that contain contaminated soil. In order to obtain site-specific data on this potential exposure route, garden vegetable and garden soil samples were collected from residential gardens. At each location where a vegetable sample was collected, a co-located sample of garden soil also was collected.

Candidate gardens were identified from property sketches generated during soil sampling, and residents were contacted by phone to determine whether vegetables remained available. Sampling began on October 7, 1999 and was completed in two weeks. At each vegetable sample location, a corresponding 0-6" grab soil sample was collected at a maximum of 6 inches from the plant.

Animal Studies

In order to investigate the relative bioavailability (RBA) of arsenic and lead in Site soils, EPA performed two separate studies in which samples of soil were fed to young swine. Swine were selected as the test species because the gastrointestinal system (and hence the behavior of ingested lead and arsenic) in swine is similar to that in humans.

As part of the study on the RBA of arsenic in Site soils, EPA tested a sample composed of Site soil at background levels mixed with a sample of the PAX 3-year Crabgrass Control product.

The soils used in the studies on RBA were subjected to extensive characterization including chemical analysis, mineral speciation, particle size distribution, and in-vitro bioaccessibility testing. The arsenic RBA study offered an opportunity to compare site soils impacted by arsenic with a background soil mixed with the PAX 3-year Crabgrass Control product to aid in EPA's effort to identify a source of the arsenic contamination.

1.5.3 Phase III Remedial Investigation Results

The Phase III program was implemented in August 1999. The field investigation was completed in September, 2000.

1.5.3.1 Surface Soils in Residential Yards

EPA obtained access to and sampled approximately 3000 of the 4000 targeted properties. Summary statistics for the bulk soil samples, based on the average values at each property and stratified by neighborhood, are summarized in Table 3. Based on the Phase III data, 30 more properties were identified for time critical removal action because of average arsenic concentrations above 400 ppm. The Action Memorandum was amended and continuation of the time critical removal action was undertaken in October, 2000. Upon completion of this work, a total of 48 residential properties had been cleaned up by EPA using time critical removal authority.

Table 3
Phase III Investigation
Summary Statistics of the Average Concentrations of Arsenic and Lead in Residential Yards

Neighborhood	Total Properties Sampled	Percentile Distribution of Average Arsenic Concentrations (ppm)					
		5th	25th	50th	75th	95th	Maximum
Clayton	902	5.5 ppm	5.5 ppm	8.7 ppm	38.3 ppm	168 ppm	758 ppm
Cole	796	5.5 ppm	7.7 ppm	11.8 ppm	24.8 ppm	142.1 ppm	660 ppm
Elyria	59	5.5 ppm	8.5 ppm	12.3 ppm	22.3 ppm	97.2 ppm	431 ppm
Globeville	63	5.5 ppm	8.5 ppm	13.8 ppm	22.3 ppm	123.3 ppm	297 ppm
Swansea	1166	5.5 ppm	5.5 ppm	9.7 ppm	30.6 ppm	128.3 ppm	604 ppm
ALL	2986	5.5 ppm	5.5 ppm	10.5 ppm	30.3 ppm	144.9 ppm	758 ppm
		Percentile Distribution of Average Lead Concentrations (ppm)					
		5th	25th	50th	75th	95th	Maximum
Clayton	902	76 ppm	106 ppm	140 ppm	193 ppm	337 ppm	1131 ppm
Cole	796	135 ppm	221 ppm	288 ppm	371 ppm	538 ppm	1130 ppm
Elyria	59	181 ppm	299 ppm	372 ppm	438 ppm	601 ppm	922 ppm
Globeville	63	171 ppm	257 ppm	332 ppm	482 ppm	633 ppm	835 ppm
Swansea	1166	76 ppm	119 ppm	164 ppm	250 ppm	410 ppm	776 ppm
ALL	2986	81 ppm	127 ppm	188 ppm	292 ppm	465 ppm	1131 ppm

EPA also compared the yard mean arsenic and lead concentrations to the year of construction for each property where the construction date was available. Yards of homes built after 1960 appear to be unimpacted by arsenic. A trend exists of decreasing levels of lead in soil at homes constructed in more recent years. A steep decrease can be seen in homes constructed in the 1980-1985 time frame.

1.5.3.2 Indoor House Dust

The results from house dust sampling show that concentrations of arsenic and lead in indoor dust are relatively consistent over a wide range of yard soil concentrations, and are poorly correlated to yard soil concentrations.

1.5.3.3 *Vegetables and Garden Soils*

The results for garden vegetables, garden soils and corresponding yard soils show that arsenic and lead in garden soils is generally lower than levels found in the yard soils. These results may be explained by residents adding soil amendments and/or fertilizers to garden soils. Arsenic and lead concentrations in vegetables remained consistently low throughout the range of garden soil concentrations.

1.5.3.4 *Soil Fine Fraction*

The results from the analysis of the fine fraction of soil in Phase III were combined with the results of the fine fraction from the Physico-Chemical Characterization Study. The combined results indicate that the concentration of arsenic in the fine fraction of soil is 21% higher than the bulk fraction and the concentration of lead in the fine fraction is 9% higher than the bulk fraction.

1.5.3.5 *Sampling of Surface Soil in Schools and Parks*

Thirty surface soil grab samples were collected from all schools and parks within the study area. The surface soil grab samples were collected from play areas and grassy areas at each school and park. A total of ten schools and seven parks were sampled. Mean arsenic concentrations in surface soils at school and parks ranged from below the method detection limit of 11 ppm to 26 ppm. The mean lead concentrations ranged from 67 ppm to 256 ppm.

1.5.3.6 *Animal Studies*

The studies on the RBA of arsenic and lead in Site soils found that:

- Arsenic in Site soils is less well absorbed than a readily soluble form of arsenic. The study determined a Site-specific arsenic RBA of 42% was appropriate for risk assessment purposes. This percentage reflects the 95% upper confidence limit of the mean arsenic RBA of the five Site soils tested.

- Lead in Site soils is less well absorbed than a readily soluble form of lead. The study determined a Site-specific RBA of 84% was appropriate for risk assessment purposes. This percentage reflects the mean of the lead RBA of the two Site soils tested. This lead RBA is higher than the EPA default value of 60%, suggesting that the lead in Site soils is in a form that can be readily absorbed.

1.6 Current and Potential Future Site and Resources Uses

OU1 is currently residential in nature. The Site covers an area of approximately 4.5 square miles which includes schools, parks, retail businesses and over 4000 residences. The Site is developed with very little vacant land available. In discussions with the City and County of Denver, there are no reasonably foreseeable changes in the future land use of the Site.

1.7 Summary of Site Risks

Using the extensive data from the Phase III program, EPA completed a quantitative baseline human health risk assessment which evaluated current and anticipated future exposure of residents within OU1 to concentrations of arsenic and lead measured in soil collected from their yards (EPA 2001a). The risk assessment was based on the following considerations:

- a residential land use as the reasonably anticipated future land use;
- the individual residential yard (or a sub-location of the yard for short term exposures) as an exposure unit, which resulted in 3000 individual risk calculations for OU1 properties;
- risk evaluation using both the average and Reasonable Maximum Exposure (RME) exposure assumptions;
- for arsenic, exposure pathways of concern that included incidental ingestion of soil and dust which could cause chronic or sub-chronic effects, ingestion of home grown garden vegetables which could cause chronic effects, and intentional ingestion of large amounts of soil by children with soil pica behavior, which could cause acute effects; and
- for lead, exposure pathways of concern included incidental ingestion of soil and dust by children as well as total exposure via all sources and pathways in the environment rather than to Site related exposures only, and use of the Integrated Exposure/Uptake Biokinetic Model (IEUBK) to evaluate risks.

For arsenic, EPA relied on guidance contained in the Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-30 (EPA 1991) to determine the level of risk that is unacceptable, warranting remedial action. Individual yards where the cancer risk based on reasonable maximum exposure to arsenic is predicted to be greater than 10^{-4} and/or the non-cancer hazard quotient (HQ) is predicted to be greater than 1 were identified as remedial action candidates. This is consistent with EPA regulations in the National Contingency Plan (NCP) (40 CFR Part 300) that establish a range of acceptable risk as 10^{-4} - 10^{-6}.

The adverse health effect associated with lead exposure that was considered by EPA is lead-induced neurobehavioral effects in children. EPA's OSWER determined that, in Superfund site cleanups, EPA will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10 micrograms per deciliter (ug/dL) (EPA 1994).

The baseline human health risk assessment indicates:

- The cancer risks exceed the acceptable risk range at properties where the arsenic Exposure Point Concentrations (EPC) is 240 ppm or greater. In accordance with EPA guidance, remedial action is warranted at these properties. At properties where the arsenic EPC is less than 240 ppm, the RME cancer risks are within the acceptable range. There are 99 properties where the arsenic EPC is 240 ppm or greater. Of these 99 properties, there are 26 properties where the predicted RME hazard quotient exceeds 1 for chronic non-cancer effects and 7 properties where the predicted RME hazard quotient exceeds 1 for both subchronic and chronic non-cancer effects. Remedial action at the 99 properties where RME cancer risks are unacceptable will also address unacceptable RME non-cancer risks (both chronic and sub-chronic).

- Screening level estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in acute HQ greater than 1 for the average soil pica scenario, and between 662 and 1841 for the RME soil pica scenario. The wide range of potentially affected properties, 294-1841, reflects the substantial uncertainty in quantifying these risks. The RME acute HQ exceeds 1 at yards where arsenic levels are 47 ppm or higher.

- The IEUBK model predicts that there is a greater than 5% chance that a child will have a blood level of 10 ug/dL as a result of exposure to lead in soil at 1331 properties. The concentration of lead in soil at these properties is 208 ppm or greater. The results of IEUBK model runs with other than default parameters indicate that there are no properties where lead levels in soil are predicted to result in a greater than 5% chance that a child will have a blood level of 10 ug/dL, suggesting that remedial action to address lead in soil may not be warranted. In this case, the concentration of lead in soil triggering remedial action is 1,100 ppm. These factors led EPA to initially determine that, in order to be protective, remedial action is warranted at yards where the lead EPC is greater than 540 ppm, a value in the middle of the range.

A detailed summary of the baseline human health risk assessment is provided in the following sections.

1.7.1 Human Health Risks Associated with Potential Exposure to Arsenic

The exposure pathways of concern to residents are incidental ingestion of soil and dust which could cause chronic or sub-chronic effects, ingestion of home grown garden vegetables which could cause chronic effects, and intentional ingestion of large amounts of soil by children with soil pica behavior, which could cause acute effects. Table 4 summarizes the potentially exposed populations, exposure pathways, and potential health effects assessed by EPA. The potential health effects associated with arsenic exposure that were considered by EPA are:

- **Acute non-cancer effects:** irritation of the gastrointestinal tract leading to nausea and vomiting. EPA has not previously considered arsenic to be an acute toxicant in soil. This health effect was evaluated at VB/I-70 OU1 based on at the recommendation of ATSDR. This required that EPA develop a new reference dose protective of acute effects.

  EPA evaluated the risk that these effects could potentially result from a one-time exposure to arsenic by a child with soil pica behavior who happens to ingest a lot of soil from a small area of a yard that contains elevated arsenic levels.

- **Subchronic non-cancer effects:** diarrhea, vomiting, anemia, injury to blood vessels, damage to kidney and liver, and impaired nerve function.

EPA evaluated the risk that these effects could potentially result from lower level exposure for periods of a few months to several years by a child who plays preferentially in a small area of a yard during the summer months and happens to incidentally ingest soil at a high rate (characteristic of the upper percentile of the general population).

- <u>**Chronic non-cancer** effects:</u> similar to subchronic effects but also include skin abnormalities.

  EPA evaluated the risk that these effects could potentially result from lower level exposure over a long period of time. Risks could be associated with long term incidental ingestion of soil and dust and ingestion of home grown garden vegetables by long time area residents who have spent their childhood and adult years living at the same residence.

Table 4

Potentially Exposed Populations and Exposure Pathways for Current and Reasonably Anticipated Future Scenarios Arsenic Risk Assessment, VB/I-70 OU1

Exposure Pathway	Potentially Exposed Population			Potential Health Effects			
	child	adult residen t	adult worker	cute	ub-chronic	hronic non-cancer	hronic cancer
pica soil ingestion	X			+			
soil ingestion	X				+		
soil and dust ingestion	X	X	x			+	+

Table 4

Potentially Exposed Populations and Exposure Pathways for Current and Reasonably Anticipated Future Scenarios Arsenic Risk Assessment, VB/I-70 OU1

vegetable ingestion	X	X				+	+
particulate inhalation	x	x	x				
dermal contact	x	x	x				

x - complete but insignificant pathway, screening evaluation

X - complete and potentially significant pathway, quantitative evaluation

+ - potential health effect assessed for given exposure pathway

- <u>Cancer effects:</u> skin cancer, internal cancer including cancer of the bladder and lung

    EPA evaluated the risk that these effects could potentially result from lower level exposure over a long period of time. Risks could be associated with long term incidental ingestion of soil and dust and ingestion of home grown garden vegetables by long time area residents who have spent their childhood and adult years living at the same residence.

The baseline human health risk assessment quantified potential risks to residents with average levels of exposure and to residents with "reasonable maximum" levels of exposure. Consideration of the reasonable maximum exposure scenario is required by EPA regulations in the NCP (40 CFR Part 300). The intent of the reasonable maximum exposure scenario is to estimate an exposure case that is conservative, yet still within the range of possible exposures. Reasonable maximum is generally intended to characterize the 90th-95th percentile of the exposed population.

Consideration of both average exposures and reasonable maximum exposures gives the risk manager a range of risk estimates to provide an indication of the variability, uncertainty, and inherent protectiveness in the assumptions used to quantify potential risks.

The Phase III program generated arsenic data primarily to support assessments of chronic exposure and risk. For each property sampled, a conservative estimate of the yard-wide average concentration of arsenic, the 95% UCL, was used as the EPC in the chronic cancer and non-cancer risk assessments in accordance with EPA guidance (EPA 1992).

1.7.1.1 Cancer and Non-cancer Risks from Chronic Exposure

Long term exposure is estimated using the following general equation:

$$\text{Dose} = \frac{(\text{EPC}) \times (\text{intake}) \times (\text{exposure frequency}) \times (\text{exposure duration})}{(\text{body weight}) \times (\text{averaging time})}$$

Table 5 summarizes the assumptions used for each of the parameters in the equation. Most values are default assumptions recommended by EPA. However, Site-specific data collected during the Phase III program was used to increase the accuracy of the risk assessment. The Phase III data used to better characterize exposure are:

- relationship between arsenic concentrations in the fine and bulk fractions of soil,
- relationship between arsenic concentrations in yard soil and indoor dust,
- relationship between arsenic concentrations in yard soil, garden soil, and garden vegetables, and
- measurements of RBA of arsenic in VB/I-70 Site soils.

Table 5

Exposure Parameters for Chronic Exposure to Soil, Dust, and Vegetables

	AVERAGE		**REASONABLE MAXIMUM EXPOSURE**	
	child	**adult**	**child**	**adult**
concentration of arsenic in soil (ppm)	EPC[1]	EPC[1]	EPC[1]	EPC[1]
adjustment for fine fraction	1.21	1.21	1.21	1.21
concentration of arsenic in dust (ppm)	estimated from site specific relationship of soil to dust dust = .06soil	estimated from site specific relationship of soil to dust. dust = .06soil	estimated from site specific relationship of soil to dust dust = .06soil	estimated from site specific relationship of soil to dust dust = .06soil
daily intake rate of soil and dust (milligrams /day)	100	50	200	100
fraction of total intake that is soil	45%	45%	45%	45%
exposure frequency (days/year)	234	234	350	350
exposure duration (years)	2	7	6	24

Table 5 Exposure Parameters for Chronic Exposure to Soil, Dust, and Vegetables				
body weight (kilograms)	15	70	15	70
concentration of arsenic in vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables
daily ingestion rate of home grown vegetables (kilograms/day)	0.007	0.35	0.007	.35
Arsenic RBA (EPA 2001b)	0.42	0.42	0.42	0.42
Averaging time for cancer effects (years)	70	70	70	70
Averaging time for non-cancer effects (years)	9	9	30	30

1. EPC is the exposure point concentration. Over the long term, residents will be exposed to the average arsenic levels in their yards. EPA recommends that the 95% UCL of the average or the maximum concentration (whichever is lower) be used as the EPC (EPA 1989). At the VB/I-70 Site, the EPC is the lower of the 95% UCL of the 3 composite samples or the maximum composite sample.

Risk is quantified by multiplying the dose by the slope factor for cancer risk, and dividing the dose by the reference dose to determine the non-cancer Hazard Quotient (HQ). Table 6 summarizes the toxicity factors used in the chronic arsenic risk assessment.

Table 6 Arsenic Toxicity Values		
Toxicity Factor	**Value**	**Source**
Chronic Reference Dose	0.0003 mg/kg/day	IRIS, 2000
Oral Slope Factor	1.5 /(mg-kg/day)	IRIS, 2000

The baseline human health risk assessment indicates:

- Cancer risks to area residents with **average levels of exposure** range from **2×10^{-6} to 9×10^{-5}**. There are no properties where cancer risks are predicted to exceed the unacceptable risk range of 1×10^{-4} for average levels of exposure.

- Cancer risks to area residents with **reasonable maximum levels of exposure** range from **1×10^{-5} to 8×10^{-4}**. Cancer risks exceed 1×10^{-4} for reasonable maximum levels of exposure where the arsenic EPC is 240 ppm or greater. There are 99 such properties.

- Chronic non-cancer risks to area residents with **average levels of exposure** range from less than or equal to the chronic reference dose (hazard quotient ≤ 1) to 2 times the chronic reference dose (hazard quotient = 2). The ratio of Site dose to a reference dose is the "hazard quotient (HQ)". The

HQ exceeds 1 for average levels of exposure where the arsenic EPC is 1300 ppm or greater. There are only 2 such properties.

- Chronic non-cancer risks to area residents with **reasonable maximum levels of exposure** range from less than or equal to the chronic reference dose (HQ $\leq$ 1) to 5 times the chronic reference dose (HQ = 5). The HQ exceeds 1 for reasonable maximum levels of exposure where the arsenic EPC is 450 ppm or greater. There are 26 such properties.

1.7.1.2 Risk of Subchronic Non-Cancer Effects

Sub-chronic exposure is estimated using the same general equation. Exposure parameters are chosen to characterize short term exposures:

$$\text{Dose} = \frac{\text{(concentration) x (intake) x (exposure frequency) x (exposure duration)}}{\text{(body weight) x (averaging time)}}$$

Table 7 summarizes the assumptions used for each of the exposure parameters in the equation for sub-chronic exposure. In this scenario, during a 1 - 3 month period such in the summer months, a child is assumed to play in a particular sub-location of a yard where the arsenic concentrations are higher than the yard average. EPA chose the 90th percentile concentration in each yard as the concentration for sub-chronic exposure. The 90th percentile concentration was estimated at each yard from the mean and the coefficient of variation. For the risk assessment, the EPC was used as a conservative estimate of the mean at each property. The 90th percentile is 2.07 times the EPC.

Table 7
Exposure Parameters for Sub-Chronic Exposure to Soil

EXPOSURE PARAMETER	**AVERAGE**	**REASONABLE MAXIMUM EXPOSURE**
	child	**child**
concentration of arsenic in soil (ppm)	90th percentile concentration in yard (2.07) x (EPC)	90th percentile concentration in yard (2.07) x (EPC)
adjustment for fine fraction	1.21	1.21
daily intake rate of soil (milligrams /day)	200	400
fraction of total intake that is soil	100%	100%
exposure frequency (days/month)	15	25
body weight (kilograms)	12.3	12.3

Table 7 Exposure Parameters for Sub-Chronic Exposure to Soil		
Relative bioavailability	0.42	0.42
Averaging time (days)	30	30

To calculate the sub-chronic HQ, EPA used a sub-chronic reference dose of 0.015 mg/kg/day developed by an EPA/ATSDR interagency workgroup (EPA 2001c).

The baseline human health risk assessment indicates:

- Sub-chronic risks to children with **average levels of exposure** are predicted to be less than or equal to the sub-chronic reference dose (HQ $\leq$ 1). There are no properties with arsenic concentrations that are predicted to result in a sub-chronic hazard quotient greater than 1 for average levels of exposure.

- Sub-chronic risks to children with **reasonable maximum levels of exposure** range from less than or equal to the sub-chronic reference dose (HQ $\leq$ 1) to 3 times the sub-chronic reference dose (HQ = 3). The HQ exceeds 1 where the arsenic EPC is 800 ppm or greater. There are 7 properties such properties.

EPA chose the 95th percentile concentration in each yard as the concentration for acute exposure. The 95th percentile concentration was estimated at each yard from the mean and the coefficient of variation. For the risk assessment, the EPC was used as a conservative estimate of the mean at each property. The 95th percentile is 2.81 times the EPC.

1.7.1.3 Risk of Acute Effects

EPA's evaluation of the risk of acute effects from exposures to arsenic associated with soil pica behavior in children is considered to be a screening level evaluation because of the substantial uncertainty that exists in most of the exposure assumptions. The evaluation is complicated by the fact that EPA and ATSDR employ different values for the reference dose and the assumptions about soil ingestion rates for a child with soil pica behavior.

To account for the differences between ATSDR and EPA concerning the appropriate acute reference dose and exposure assumptions to characterize pica behavior, EPA evaluated 2 "cases" of the soil pica exposure scenario to reflect the 2 agencies' recommendations. Table 8 summarizes the assumptions used for each of the exposure parameters in the equation for acute exposure.

Table 8 Exposure Parameters for Soil Pica Exposure to Soil		
EXPOSURE PARAMETER	AVERAGE	REASONABLE MAXIMUM EXPOSURE
	child	child

Table 8 Exposure Parameters for Soil Pica Exposure to Soil		
concentration of arsenic in soil (ppm)	95th percentile concentration in yard (2.81) x (EPC)	95th percentile concentration in yard (2.81) x (EPC)
adjustment for fine fraction	N/A	N/A
daily intake rate of soil (milligrams /day)	5,000 (case 1) 2,000 (case 2)	10,000 (case 1) 5,000 (case 2)
fraction of total intake that is soil	100%	100%
body weight (kilograms)	12.3	12.3
Relative bioavailability	0.42	0.42

To calculate the acute HQ, EPA used the ATSDR Minimum Risk Level of 0.005 mg/kg/day as the reference dose for "Case 1". EPA used an acute reference dose of 0.015 mg/kg/day developed by an EPA/ATSDR interagency workgroup (EPA 2001c) for "Case 2".

The screening level calculations of acute risk indicate:

- Acute risks to children with **average soil pica exposures** range from less than or equal to the reference dose (HQ $\leq$ 1) to 100 times the reference dose (HQ = 100). The HQ exceeds 1 for average soil pica exposures where the arsenic EPC is greater than 16 ppm (case 1) or 118 ppm (case 2). There are between 294 and 1511 such properties.

- Acute risks to children with **reasonable maximum soil pica exposures** range from less than or equal to the reference dose (hazard quotient $\leq$ 1) to 300 times the reference dose (hazard quotient =300). The HQ exceeds 1 for reasonable maximum soil pica exposures where the arsenic EPC is greater than 8 ppm (case 1) or 47 ppm (case 2). There are between 662 and 1841 such properties.

Table 9 summarizes the results of the baseline human health risk assessment for arsenic.

Unacceptable Risks that Warrant Remedial Action

EPA relied on the baseline risk assessment results to determine which properties in OU1 require remedial action. As a first step, EPA considered the cancer risks, the chronic non-cancer risks, and the sub-chronic non-cancer risks. This is because EPA has more confidence in these risk calculations than those for the acute risks which are considered screening level only.

Table 10 summarizes the arsenic EPCs associated with various cancer risk estimates for the reasonable maximum exposure scenario. From this table, it is clear that cancer risks exceed the acceptable risk range at properties where the arsenic EPC is 240 ppm or greater. In accordance with EPA guidance, remedial action is warranted at these properties. At properties where the arsenic EPC is less than 240 ppm, the RME cancer risks are within the acceptable range.

There are 99 properties where the arsenic EPC is 240 ppm or greater. Of these 99 properties, there are 26 properties where the predicted RME hazard quotient exceeds 1 for chronic non-cancer effects and 7 properties where the predicted RME hazard quotient exceeds 1 for both subchronic and chronic non-cancer effects. Remedial action at the 99 properties where RME cancer risks are unacceptable will also address unacceptable RME non-cancer risks (both chronic and sub-chronic).

As the second step in determining where remedial action should be undertaken, EPA next considered if remediation is appropriate even though risks appeared to be within the acceptable risk range. EPA consulted the guidance in OSWER Directive 9355.0-30 (EPA 1991) which states that:

- EPA should clearly explain why remedial action is warranted if baseline risks are within the acceptable risk range of 10^{-4} to 10^{-6}, and

- A risk manager may decide that a level of risk lower than 10^{-4} warrants remedial action where, for example, there are uncertainties in the risk assessment results.

EPA carefully evaluated the uncertainty in the OU1 risk assessment.

<u>*Uncertainty in the Risk Estimates*</u>

The Phase III program included several studies specifically designed to increase the accuracy (reduce uncertainty) of the risk estimates for OU1. The first was a study to investigate the RBA of arsenic in soil at the VB/I-70 Site (EPA 2001d).

In the absence of Site-specific information on RBA, it is common practice to use a default assumption as the value for this parameter or to ignore RBA altogether in risk estimates. However, where accuracy of risk estimates is important to risk managers, measurements of RBA based on site specific soils significantly reduce the uncertainty in estimates of this parameter.

Table 9 Summary of Cumulative Risks to Residents Arsenic Risk Assessment, VB/I-70 OU1 Soils				
Exposure Pathways and Health Effect	**Average or Central Tendency Exposure**		**Reasonable Maximum Exposure**	
	Range of Calculated Risks	**# properties where risks are predicted to be unacceptable**	**Range of Calculated Risks**	**# properties where risks are predicted to be unacceptable**
acute non-cancer effects • soil ingestion / pica	$0.07 \leq HQ^{1} \leq 100$	294-1511[2]	$0.2 \leq HQ \leq 300$	662- 1841[2]
subchronic non-cancer effects • incidental soil ingestion	$0.003 \leq HQ \leq 0.8$	0	$0.01 \leq HQ \leq 3$	7
chronic non-cancer effects • incidental soil and dust ingestion, and • vegetable ingestion	$0.04 \leq HQ \leq 2$	2	$0.1 \leq HQ \leq 5$	26
cancer effects • incidental soil and dust ingestion, and • vegetable ingestion	**$2 \times 10^{-6} \leq$ Cancer Risk $\leq 9 \times 10^{-5}$**	**0**	**$1 \times 10^{-5} \leq$ Cancer Risk $\leq 8 \times 10^{-4}$**	**99**

1. HQ = hazard quotient, defined as ratio of predicted site dose to EPA reference dose
2. There is a range of properties instead of a discrete number because EPA calculated risks using the EPA acute reference dose for one case and the ATSDR provisional acute MRL for the second case.

Table 10 Summary of RME Cancer Risks and Associated Arsenic EPCs		
Cancer Risk based on Reasonable Maximum Exposure Assumptions	**Arsenic EPC**	**# properties in VB/I-70 at this risk level**
8×10^{-4}	1356 ppm - 1418 ppm	2
6×10^{-4}	927 ppm	1
5×10^{-4}	839 ppm - 898 ppm	4
4×10^{-4}	595 ppm - 688 ppm	11
3×10^{-4}	413 ppm - 522 ppm	12
2×10^{-4}	240 ppm - 410 ppm	69
1×10^{-4}	146 ppm - 238 ppm	131
9×10^{-5}	129 ppm - 145 ppm	38
8×10^{-5}	113 ppm - 127 ppm	47
7×10^{-5}	94 ppm - 111 ppm	58
6×10^{-5}	77 ppm - 93 ppm	78
5×10^{-5}	60 ppm - 76 ppm	100
4×10^{-5}	43 ppm - 59 ppm	159
3×10^{-5}	26 ppm - 42 ppm	275
2×10^{-5}	11 ppm - 25 ppm	1068
1×10^{-5}	5.5 ppm	933

In the study on OU1 soils, the RBA of arsenic was measured in 5 different soils collected from residential yards in the 4 main neighborhoods of the site. As expected, the RBA of arsenic varied between the five different site soils. EPA used the 95% UCL of the mean of the five values in the baseline risk assessment. This approach is expected to overestimate the true value of this parameter for any given soil in the residential yards in the Site. Thus the accuracy of the risk estimate was increased by using a VB/I-70 Site-specific value, and protectiveness was achieved by using a conservative estimate of the mean of all values measured.

The second study provided Site-specific relationships between:

- arsenic in yard soil and arsenic in house dust;

- arsenic in yard soil and arsenic in garden soils;
- arsenic in garden soils and arsenic in garden vegetables; and
- arsenic in the bulk fraction and the arsenic in the fine fraction of soil.

Establishing these Site-specific relationships reduces the uncertainty in quantifying exposure and risk associated with incidental ingestion of soil and dust and ingestion of garden vegetables.

Uncertainties in the Estimates of Acute Risks

As the third step in determining which properties require remedial action, EPA considered the screening level assessment of acute risks associated with soil pica behavior. The RME acute HQ exceeds 1 at yards where arsenic levels are 8 ppm or higher (case 1) or 47 ppm or higher (case 2). In evaluating the uncertainty in these calculations, two important facts were considered: (1) the distribution of soil ingestion rates for children with soil pica behavior is not known, and (2) the frequency with which such children exhibit the behavior is also not known. Therefore, the application of Monte Carlo techniques to analyze the uncertainty in the calculations of acute risk is difficult and was not performed by EPA for the VB/I-70 Site.

However, these screening level estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in acute HQ greater than 1 for the average soil pica scenario, and between 662 and 1841 for the RME soil pica scenario. The wide range of potentially affected properties, 294-1841, reflects the substantial uncertainty in quantifying these risks.

EPA also considered the following:

- EPA is not aware of any reported cases of acute arsenic toxicity attributable to ingestion of arsenic in soil.
- Limited data on urinary arsenic levels in residents of the nearby Globeville neighborhood do not reveal the occurrence of high soil intakes by children.
- Inquiries by CDPHE into reports of known or suspected cases of arsenic poisoning in the community surrounding the VB/I-70 site resulted in its conclusion, stated in a July 25, 2001 letter, that ". . .it appears that there is no obvious or identifiable problem of arsenic exposure from environmental sources in the area of concern." (CDPHE 2001).
- Extensive data on urinary arsenic levels in children who live in VB/I-70 OU-1 were collected during the "Kids at Play" Health Survey conducted by CDPHE and the University of Colorado Health Sciences Center during the summer of 2002. These important data indicate there is no evidence of exposures to arsenic at levels indicative of acute exposures.

The above facts suggest that risk of acute arsenic exposure from soil pica behavior may not be as significant as the theoretical calculations for OU1 suggest. However, because of the high uncertainty regarding the magnitude and frequency of soil pica behavior, more reliable risk estimates for this scenario will not be possible until better data are collected on soil intake rates characteristic of soil pica behavior along with direct measurements of soil related exposures to arsenic. Therefore, given this uncertainty, EPA determined it was appropriate to consider a lower action level to develop remedial alternatives to decrease the possibility that a child exhibiting soil pica behavior will be at risk for acute arsenic exposure from soil in his/her yard.

Weighing the substantial uncertainty in the acute risk assessment, and recognizing that the calculations are theoretical, EPA determined that in order to be protective, remedial alternatives would be developed and evaluated for effectiveness in addressing the theoretical acute risks to children with soil pica at all properties where the arsenic EPC is 47 ppm or greater, based on the "Case 2" scenario. In choosing 47 ppm as the level triggering response, EPA is recognizing that existing exposure data provides no evidence of the widespread acute exposures suggested by the "Case 1" scenario.

In summary, EPA determined that remedial action at properties where the arsenic EPC is 240 ppm or greater will protect residents from unacceptable RME cancer, chronic non-cancer, and subchronic non-cancer risks. Remedial action at properties where the arsenic EPC is 47 ppm or greater will be evaluated for effectiveness in protecting soil pica children from theoretical unacceptable acute risk.

1.7.2 <u>Human Health Risks Associated with Potential Exposure to Lead</u>

EPA's quantitative baseline human health risk assessment for OU1 also considered the health risks to young children associated with exposure to lead in soil. Table 11 summarizes the potentially exposed populations, exposure pathways, and potential health effects assessed by EPA.

EPA evaluates risks associated with exposure to lead by considering total exposure via all sources and pathways in the environment rather than to site related exposures only. This evaluation requires assumptions about the level of lead in food, air, water, and paint as well as the level of lead measured in yard soils. The Integrated Exposure/Uptake Biokinetic Model (IEUBK) is the recommended tool for assessing lead risks.

In order to increase the accuracy of the model results, EPA used VB/I-70 site-specific data on the relationship between lead in the fine and bulk fractions of soil, the relationship between lead in yard soil and lead in house dust (EPA 2001d), and the RBA of lead in soils (EPA 2001e) as inputs to the model. Tables 12 and 13 summarize the values used for the IEUBK model parameters.

The adverse health effect associated with lead exposure that was considered by EPA is lead-induced neurobehavioral effects in children. EPA OSWER guidance directs that, in Superfund site cleanups, EPA will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10 micrograms per deciliter (ug/dL) (EPA 1994).

Using the values summarized in Tables 12 and 13, the IEUBK model predicts that there is a greater than 5% chance that a child will have a blood level of 10 ug/dL as a result of exposure to lead in soil at 1331 properties. The concentration of lead in soil at these properties is 208 ppm or greater.

Table 11 Potentially Exposed Populations and Exposure Pathways for Current and Reasonably Anticipated Future Scenarios Lead Risk Assessment, VB/I-70 OU1 Soils							
Exposure Pathway	**Potentially Exposed Population**			**Potential Health Effects**			
	child	adult resident	adult worker	cute	ub-chronic	hronic non-cancer	hronic cancer
pica soil ingestion							
soil ingestion							
soil and dust ingestion	**X**		x		+		
vegetable ingestion	x						
particulate inhalation	x		x				
dermal contact	x		x				

x - complete but insignificant pathway, screening level evaluation

X - complete and potentially significant pathway, quantitative evaluation

\+ - potential health effect assessed for given exposure pathway

Table 12 IEUBK Model Inputs	
IEUBK Model Input	**Value**
concentration of lead in soil	EPC[1]
adjustment for fine fraction	1.09
concentration of lead in dust	estimated from site specific relationship of soil to dust dust = 0.34 soil + 150
concentration of lead in outdoor air	0.10 micrograms per cubic meter
concentration of lead in indoor air	30% of concentration in outdoor air
concentration of lead in drinking water	4 micrograms per liter
absorption fractions: air diet water soil and dust	 32% 50% 50% 84% of 50% = 42% (from lead RBA study)
fraction of daily intake that is soil	45%
geometric standard deviation of blood lead values	1.6

1. The EPC is the average of 3 composite samples collected from the property

Table 13 Age Dependent IEUBK Model Inputs					
Age	**AIR**		**DIET**	**WATER**	**SOIL**
(Years)	**time outdoors (hours)**	**breathing rate (m^3/day)**	**dietary intake (micrograms/day)**	**intake (liters/day)**	**intake (milligrams /day)**
0-1	1.0	2.0	3.87	0.20	85
1- 2	2.0	3.0	4.05	0.50	135
2- 3	3.0	5.0	4.54	0.52	135
3- 4	4.0	5.0	4.37	0.53	135
4- 5	4.0	5.0	4.21	0.55	100
5- 6	4.0	7.0	4.44	0.58	90
6- 7	4.0	7.0	4.90	0.59	85

1.7.2.1 Consideration of Uncertainties in the Baseline Human Health Risk Assessment for Lead

In order to investigate uncertainty in the IEUBK model predictions for OU1, EPA ran the model again varying In order to investigate some of the sources of uncertainty in the IEUBK model predictions for OU1, EPA ran the model a number of times, varying the values for dietary lead intake, geometric standard deviation of blood lead levels, and soil intake rate to reflect recently published data. The results of the alternative model runs are presented in the final Baseline Human Health Risk Assessment.

Each alternative IEUBK model run predicts that EPA's health goal for lead in soil will be met at a specific average soil lead concentration or lead EPC in an individual yard. The alternative model runs performed by EPA resulted in a range of such EPCs presented in Table 14. Remedial action may be warranted at properties where the lead EPC is greater than a value within this range to achieve EPA's health goal.

EPA considered the following factors in determining what concentration in the range warrants remedial action:

- Available blood lead data indicates that elevated blood lead levels are not observed in children in the VB/I-70 Site.
- Predictions using blood lead models suggest a range of possible responses, from soil not being required to be removed to achieve EPA's health goal for lead in soil, to removing soil contaminated with 208 ppm lead.

These factors led EPA to initially determine that, in order to be protective, remedial action is warranted at yards where the lead EPC is greater than 540 ppm, a value in the middle of the range of values in Table 14. Remedial action at properties where the lead EPC is greater than 208 ppm, the low end of the range, will be evaluated for effectiveness in achieving EPA's health goal for lead in soil.

Table 14
Range of EPCs predicted to meet EPA's Health Goal for Lead in Soil at OU1 of the VB/I-70 Site

IEUBK Model Run	soil intake rates	Dietary Lead Intake Values	Geometric Standard Deviation of Blood Lead Values	Predicted Lead Soil Level at P10 < 5% [1] (ppm)
1	default	default	1.6 (default)	208
2	default	revised	1.6 (default)	246
3	default	default	1.4	326
4	default	revised	1.4	362
5	default	revised	1.3	443
6	default	default	1.2	542
7	default	revised	1.2	581
8	Stanek and Calabrese, 2000	default	1.6 (default)	1100

1. P10 < 5% = less than 5% probability that blood lead levels exceed 10 ug/dL

EPA also predicted blood lead levels in children in the VB/I-70 Site using a model other than the IEUBK. The results of this modeling effort, also presented in the final Baseline Human Health Risk Assessment, indicate that there are no properties where lead levels in soil are predicted to result in a greater than 5% chance that a child will have a blood level of 10 ug/dL, suggesting that remedial action to address lead in soil may not be warranted.

1.7.2.2 Consideration of Observed Blood Lead Values in Children Who Reside in VB/I-70

EPA reviewed the available information on measured blood lead levels in the population of children in the VB/I-70 Site to better understand how well the IEUBK model was predicting blood lead levels at OU1. The CDPHE offered three separate blood lead testing programs to children living in the VB/I-70 Site during the period 1995 through 2000 and provided the results of this testing to EPA. Although the blood lead testing was not designed or intended to support risk assessment, the data support the following conclusions:

- elevated blood lead levels do occur in children residing within the Site,
- soil is not likely to be the main source of elevated blood lead levels in children, and
- the elevated blood lead levels that were observed in children within the VB/I-70 Site are not clearly different from the elevated levels observed in children who live outside of the VB/I-70 Site.

In addition, recently available data from the "Kids at Play Health Survey" indicate that EPA's health goals for children exposed to lead may currently be met. The study data indicates that less than 3.2% of the approximately 1340 children tested have elevated blood lead levels.

1.8 Remedial Action Objectives

The overall Remedial Action Objective (RAO) is to protect human health. The following OU1 specific RAOs were developed for arsenic and lead in soil:

RAOs for Arsenic in Soil

- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in an excess lifetime cancer risk associated with ingestion of soil which exceeds 1×10^{-4}, using reasonable maximum exposure assumptions.
- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in a chronic or sub-chronic hazard quotient associated with ingestion of soil which exceeds 1, using reasonable maximum exposure assumptions.
- For children with pica behavior who reside in the VB/I-70 Site, reduce the potential for exposures to arsenic in soil that result in acute effects.

RAO for Lead in Soil

- Limit exposure to lead in soil such that no more than 5 percent of young children (72 months or younger) who live within the VB/I-70 Site are at risk for having blood lead levels higher than 10 ug/dL from such exposure. This provides 95% confidence that children exposed to lead in soil will be protected.

The first and second RAOs for arsenic in soil are consistent with guidelines set out in the OSWER

Directive 9355.0-30 "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions". The objective for lead in soil is consistent with EPA's guidance in OSWER Directive 9355.4-12 that EPA should, ". . . limit exposure to soil lead levels such that a typical child or group of similarly exposed children would have an estimated risk of no more than 5 percent of exceeding the 10 ug/dL blood lead level (EPA 1994)."

Preliminary Remediation Goals (PRGs) for arsenic and lead in soil were established based on the evaluation and findings of the Baseline Human Health Risk Assessment. In accordance with the NCP (40 CFR Part 300), PRGs are the desired endpoint concentrations of lead and arsenic in soils that are protective of human health for the various exposure scenarios. The PRGs help to focus the development of remedial alternatives on technologies that can achieve the goals. At OU1, PRGs were set at background concentrations for both lead and arsenic. Remedial alternatives were evaluated for how effective they are in achieving the PRGs at those properties where remedial action is warranted.

It is estimated that background levels of arsenic range up to about 15 ppm. Lifetime cancer risk associated with exposure to background concentrations of arsenic in soil is approximately $1x10^{-5}$, a level within EPA's acceptable risk range. However, the screening level calculations of acute risk associated with soil pica behavior indicate that the acute HQ exceeds 1 (indicating an unacceptable risk) under some scenarios even where arsenic is at background levels.

Lead levels in bulk soil range below the detection limit (about 52 ppm) up to a maximum of more than 1,000 ppm. If it is assumed that the upper range of lead concentrations resulting from natural and area-wide anthropogenic sources is about 400 ppm, then the mean of all samples that are less than 400 ppm is about 195 ppm. This value is considered by EPA to be a rough estimate of the average background concentration of lead in soil at OU1.

In order to identify the specific properties for which remedial alternatives will be developed and evaluated, EPA established Preliminary Action Levels in the FS. These are exposure point concentrations (EPCs) above which some remedial action is warranted. An EPC is a conservative estimate of the mean concentration within an individual yard. These preliminary action levels are:

a. an EPC of 47 ppm arsenic, which is the level at which the Baseline Human Health Risk Assessment predicts the RME acute non-cancer HQ is greater than 1 for the Case 2 pica scenario;

b. an EPC of 240 ppm arsenic, which is the level at which the Baseline Human Health Risk Assessment predicts RME lifetime cancer risks exceed 1×10^{-4};

c. an EPC of 208 ppm lead, which equates to a less than 5% chance that any child will have a blood lead value above 10 ug/dL based on the IEUBK model adjusted by using Site-specific data on the levels of lead in house dust and the relative bioavailability of lead in site soils; and

d. an EPC of 540 ppm lead, which also equates to a less than 5% chance that any child will have a blood lead value above 10 ug/dL based on an alternate IEUBK model run.

These concentrations equate to the EPCs used in the Baseline Human Health Risk Assessment and any evaluation of concentrations of lead or arsenic in residential yard soils must use the same sampling methodology as the RI and same evaluation methodology as the risk assessment to provide comparable results.

1.9 Description of Alternatives

Based on Site conditions and RAOs, a range of General Response Actions (GRAs) were identified. GRAs are general categories of remedial activities (e.g.,no action, institutional controls, containment, etc.) that may be undertaken, either singly or in combination, to satisfy the requirements of the RAOs. Remedial technologies and process options are more specific applications of the GRAs. Remedial technologies and process options were identified for each GRA and screened in accordance with procedures described in RI/FS guidance. In the first screening step, remedial technologies that have limited or no potential for implementation at the Site were eliminated. Remedial technologies and process options that passed the initial screening test were then subjected to a second, more rigorous, screening evaluation of their anticipated effectiveness, potential implementability and relative cost.

1.9.1 Remedial Technologies

Three remedial technologies were retained from the screening evaluation: (1) Community Health Program, (2) Soil Tilling/Treatment, and (3) Soil Removal/Disposal. These remedial technologies were used individually or in combination to develop the remedial alternatives. In addition, a similar set of technologies were used in several alternatives. In this case, the primary difference between the alternatives is the soil clean up action levels for lead and arsenic. A description of each of these technologies is provided below.

1.9.1.1 Community Health Program

The Community Health Program would be composed of two separate (but partially overlapping) elements. The first element would be designed to address risks to area children from non-soil sources of lead, and to the extent that they exist, risks from lead in soils not yet remediated that are above the action level. The second element would be designed to address risks to area children from pica ingestion of arsenic in soil above the preliminary action level of 47 ppm. Participation in one or both elements of the program would be strictly voluntary, and there would be no charge to eligible residents and property owners for any of the services offered by the community health program. Each of these two main elements of the program is described below.

Community Health Program for Lead. The program for reduction of lead risks is intended to be general. That is, it is intended to assess risks from lead from any and all potential sources of exposure, with response actions tailored to address the different types of exposure source that may be identified. The lead program will consist of three main elements:

1. Community and individual education about potential pathways of exposure to lead, and the potential health consequences of excessive lead exposure.

2. A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure.

3. A program to respond to any observed lead exposure that is outside the normal range. This program will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure, and to implement an appropriate response that will help reduce the exposure.

A key component of the response program is that all potential sources of lead at a property would be sampled, including soil and interior/exterior paint. If soil is judged to be the most likely source of exposure, a series of alternative actions will be evaluated to identify the most effective way to reduce that exposure. These will include a wide range of potential alternatives, including such things as education, sodding or capping of contaminated soil, tilling/treatment, etc. If the main source is judged to be non-soil related, responses may include things such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

Community Health Program for Arsenic. Chronic cancer and non-cancer risks from incidental ingestion of arsenic in soil will be addressed by the soil removal/disposal component of this remedial alternative. The public health program for arsenic is designed to focus specifically on the potential risks to young children from pica behavior. The program for arsenic will consist of three main elements:

1. Community and individual education about identification and potential hazards of soil pica behavior and the potential health consequences of excessive acute oral exposure to arsenic.

2. A biomonitoring program by which any child may be tested to evaluate actual soil pica exposure to arsenic.

3. A program that provides a response to any observed inorganic arsenic exposures that are outside the normal range. This program will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure, and to implement an appropriate response that will help reduce the exposure.

1.9.1.2 Soil Tilling and Treatment

Soil tilling and treatment would be implemented on properties that only the lead levels exceeded the action level designated for the alternative. For properties which soil tilling is implemented, surface soils would be tilled to a depth of 6 inches and treated with phosphate to reduce the bioavailability of lead. The yard will be restored as close as possible to preconstruction condition.

1.9.1.3 Soil Removal

Soil removal would be implemented on properties that the lead and/or arsenic levels exceed the action level designated for the alternative. Accessible soils would be removed to a depth of 12 inches and transported for disposal at an appropriate location. The excavated areas would be backfilled with clean soil. The yard will be restored as close as possible to preconstruction condition.

1.9.1.4 Sampling Program

During the Remedial Investigation, approximately 75% of the residential properties within the Site boundaries had their yards tested for lead and arsenic. The sampling program is for residential yards that have not yet been sampled. In addition, sampling will be conducted at residential properties in an area outside the Remedial Investigation study area based on the Remedial Investigation soil results and the proximity of the properties to the smelters. This triangular shaped area located in the Curtis Park Neighborhood of the City of Denver and is bounded by Downing Street, Blake Street and 34th Avenue.

Each of these technologies were used in combination with differing soil clean up action levels for lead and arsenic to develop five remedial alternatives. A proposed plan describing these five alternatives was issued in May 2002. During the public comment period associated with this proposed plan, EPA received extensive comment requesting that an alternative with a lower lead soil action level, and to a lesser extent, a lower arsenic soil action level, than included in the preferred alternative, Alternative 4, be considered. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluate the new alternative, Alternative 6, which considered these lower soil action levels. The following is a detailed description of the alternatives EPA considered.

1.9.2 <u>Remedial Alternatives</u>

1.9.2.1 Alternative 1 - No Action

The No Action alternative provides a baseline for the evaluation of other alternatives in accordance with the NCP. Soils have already been removed from 48 residential properties at the Site in Time Critical Removal Actions conducted by EPA in 1998 and 2000. No additional protective or remediation measures would be taken for the No-Action option.

1.9.2.2 Alternative 2 - Community Health Program, Tilling/Treatment (Lead), Targeted Removal (Arsenic)

Alternative 2 contains the following principal components:

- Implementation of a Community Health Program;
- Tilling and treatment of yards with lead soil concentrations greater than 540 ppm;
- Soil Removal for all yards with arsenic soil concentrations greater than 240 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.3 Alternative 3 - Community Health Program, Soil Removal

Alternative 3 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 540 ppm and/or arsenic soil concentrations greater than 240 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.4 Alternative 4 - Community Health Program, Soil Removal

Alternative 4 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 540 ppm and/or arsenic soil concentrations greater than 128 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.5 Alternative 5 – Soil Removal Only

Alternative 5 contains the following principal components:

- Soil removal for all yards with lead soil concentrations greater than 208 ppm and/or arsenic soil concentrations greater than 47 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.6 Alternative 6 - Community Health Program, Soil Removal

Alternative 6 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 400 ppm and/or arsenic soil concentrations greater than 70 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.10 Comparative Analysis of Alternatives

The 6 remedial alternatives were evaluated against the threshold and balancing criteria specified in the NCP. The NCP criteria are:

Threshold Criteria

- Overall Protection of Human Health and the Environment
- Compliance with ARARs

Primary Balancing Criteria

- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility and Volume Through Treatment
- Implementability
- Cost

Modifying Criteria

- State Acceptance
- Community Acceptance

Detailed analyses were performed for each alternative, applying each of the threshold and primary balancing criteria. The remedial alternatives were also comparatively evaluated within each criterion.

The No Action Alternative is not evaluated in the comparative analysis, but is considered as the baseline condition. The Baseline Human Health Risk Assessment indicates that no further action would be effective in preventing exposures to arsenic in soil above a 1×10^{-4} lifetime cancer risk, a chronic hazard greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. However, if no further action is taken at the Site, screening level calculations suggest that children with soil pica behavior may be at risk from doses of arsenic that exceed an acute hazard quotient of 1, even for the central tendency pica exposure scenario. Also, the No Action Alternative would not meet the RAOs for arsenic.

For lead, the probability of elevated blood lead levels predicted by the IEUBK Model provides the basis for EPA's evaluation of the No Action Alternative. When the IEUBK model is run using recently published data on soil ingestion rates for children (Stanek & Calabrese 2000), the site-specific relative bioavailability and site-specific soil/dust ratio adjustments, it predicts that no further action is necessary to achieve the RAO for lead. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that the No Action Alternative would not be effective in achieving the RAO for lead in soil. The range of results reflects the uncertainty in using the

IEUBK Model to predict whether further action is required to achieve the RAO for lead at the Site.

In order to help determine whether the IEUBK model is yielding reliable predictions at the VB/I-70 Site, USEPA compared the IEUBK model predictions to actual observations of blood lead levels in the population of children currently living at the site. Even though the available data are from studies that were not designed to support risk assessment, they do support the following:

1. Elevated blood lead levels occur in children residing within the Site.

2. Soil is not likely to be the main source of elevated blood lead levels.

3. Elevations are not clearly different from areas outside the VB/I-70 Site.

Recently available preliminary results from the Kids at Play Survey indicate that of the approximately 1340 children that have participated in the KAP survey, less than 3.2% of children tested have blood lead levels greater than 10 ug/dL. The data on blood lead levels in children residing in OU1 suggest that the No Action Alternative may be effective in meeting the RAO for lead in soil as predicted by the IEUBK Model run. This IEUBK model run uses recently published data on soil ingestion rates for children, the site-specific relative bioavailability, and the site-specific soil/dust ratio instead of using previous default parameters in order to generate these predictions.

A summary of the comparative analysis is presented below.

1.10.1 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health. The overall protection of human health of the alternatives slightly increases as the soil clean up levels decrease. The overall protectiveness increase from lowest to highest for the alternatives in this order: Alternatives 2, 3, 4, 6, 5. Alternatives 2, 3, 4, 5, and 6 all achieve The RAO's; however, there is uncertainty associated with the tilling/treatment component of Alternative 2.

In Alternative 3, removal and disposal of yard soils with arsenic EPCs at or above 240 mg/Kg or lead EPCs greater than 540 ppm would be effective in preventing exposure to these soils, which are the greatest human health concern. This would effectively achieve the RAO for lead and the first 2 RAOs for arsenic in soil. The baseline risk assessment indicates that below 240 ppm arsenic and 540 ppm lead, soil is not a major source of exposure and risk in OU1. Implementation of a community health program would be effective in achieving the RAO for lead and the third RAO for arsenic in soil by addressing the risks of exposure to non-soil sources of lead and the risks from soil pica behavior through the components of education, biomonitoring, source sampling and analysis, and response actions as necessary. The community health program would provide additional protection for the community, because it would provide the mechanism for evaluating other sources of lead (such as lead paint) that may cause exposures in the future, and for addressing soil pica behavior that may be associated with other risks in addition to the risk of acute arsenic exposure. Even if there were no detectable arsenic or lead in soil, soil pica behavior may lead to development of significant gastrointestinal disturbances and/or blockages, abdominal pain, parasitic infection, and iron deficiency. The community health program would include strategies to reduce soil pica behavior within the population of children living in the VB/I-70 Site.

Reduction in soil pica behavior would reduce the risk of these other health effects. Alternative 3 would also minimize short-term risks.

Alternative 2 may provide a similar level of protection compared to Alternative 3, but there is some uncertainty associated with the tilling/treatment component to address soils with lead EPCs above 540 ppm. Uncertainties are associated with the effect of tilling on surface soil concentrations. This uncertainty remains because concentration profiles were not generated with depth or in different yard locations for the target properties, and therefore the resultant lead concentrations in surface soil after tilling are difficult to predict. Also, the effectiveness of phosphate treatment is uncertain. This is because site-specific testing would be required to determine the chemical form and application rate necessary to achieve the preliminary remediation goals for lead in soil; and would delay implementation of this alternative for at least a year.

Alternative 4 differs from Alternative 3 by adding soil removal from properties with arsenic concentrations greater than 128 ppm. This alternative was developed and evaluated at the request of CDPHE. Specifically, CDPHE requested that EPA develop alternatives that would protect residents from cancer risks greater than a range of 3×10^{-5} to 8×10^{-5} to be consistent with cleanup objectives at the adjacent ASARCO Globe Site. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic EPC of 128 ppm corresponds to a point estimate risk level of 8×10^{-5}. Alternative 4 is as protective as Alternative 3 (and may be more protective) of overall human health and environment since it removes soil where predicted risk is lower.

Alternative 5 would provide the highest level of overall protection of human health because soils with arsenic and lead levels above 47 ppm and 208 ppm respectively would be removed.

Alternative 6 differs from Alternatives 2, 3, and 4 by adding soil removal from properties with arsenic EPCs greater than 70 ppm and/or lead EPCs greater than 400 ppm. This alternative was developed and evaluated in response to comments received on the May 2002 Proposed Plan. Those comments requested an explanation of why EPA was not considering removing soil from properties where arsenic exceeds 70 ppm as was done at the ASARCO Globe Site and where lead exceeds 400 ppm to be consistent with EPA's screening level for lead in soil. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic EPC of 70 ppm corresponds to a point estimate risk level of 5×10^{-5}. Alternative 6 would provide a higher level of long-term protection when compared to Alternatives 2, 3 and 4 because soils with arsenic and lead levels above 70 ppm and 400 ppm respectively would be removed, but would provide a somewhat lower level of long-term protection when compared to Alternative 5 because of the potential risk to children with soil pica behavior.

1.10.2 <u>Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)</u>

All of the remedial alternatives, except Alternative 1, evaluated in the comparative analysis would be expected to comply with ARARs identified in Tables 15, 16, and 17. ARARs related to the generation of fugitive dust and lead concentrations in ambient air would be applicable to the range of engineering actions under evaluation. Although the potential exists for dust generation during soil tilling and excavation, and transport and backfilling activities, engineering controls would be readily implementable and effective to achieving compliance with the applicable regulations. ARARs relating to the characterization, transport and disposal of solid wastes would be applicable for excavated soils and would be met by standard construction and transportation practices. All alternatives (except the No Action Alternative) have common ARARs which will be met during implementation.

1.10.3 Short-Term Effectiveness

Alternative 3 provides the highest level of short-term effectiveness. Soil removal actions could be quickly and effectively implemented with less risk to workers or the community than Alternatives 4, 5, and 6. Implementation of the community health program would be effective in the short term due to the components of education, biomonitoring, soil sampling and analysis, and response actions when warranted.

Consistent with the NCP (40 CFR Part 300), the evaluation of short-term effectiveness also considered the environmental impacts of soil removal actions, specifically water use required to establish grass cover in remediated yards. Watering of replacement lawns and plants is a critical component of soil removal actions. The Denver area is a semi-arid environment subject to occasional drought conditions. Watering restrictions, which have been imposed in the recent past, could impact implementability by delaying the establishment of grass cover. Soil removal actions within the adjacent Globeville neighborhood required an estimated 9.35 gallons of water to establish one square foot of replacement sod. An average yard in VB/I-70 OU1 has an estimated 5,200 square foot area of soil (EPA 2001d). Assuming that 70% of the soil area is sod, approximately 50,000 gallons of water would be required to establish sod at a typical property. Based on these assumptions, Alternative 3 would require 10 million gallons of water to implement.

TABLE 15

SUMMARY OF POTENTIAL CHEMCIAL-SPECIFIC ARARs

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/I-70 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.
Resource Conservation and Recovery Act (RCRA), Subtitle C	No	Yes	40 CFR Part 264	Provides regulation of hazardous waste.	Although RCRA Subtitle C is not generally applicable to mining related wastes, may be relevant and appropriate if the VB/I-70 excavated soils fail EPA's Toxic Characteristics Leachability Procedure. If the soils do fail EPA's TCLP, soils will be disposed of in an off-site RCRA Subtitle C facility.
Colorado Air Pollution Prevention and Control Act	Yes		5 CCR 1001-14	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS.	Construction activities associated with potential remedial actions at the Site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.
	No	Yes	5 CCR 1001-10Part C (I) Regulation 8	Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate.

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
				averaged over a one-month period.	Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the Site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 16
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
Resource Conservation and Recovery Act (RCRA), Subtitle D	Yes		40 CFR 257	Facilities where treatment, storage, or disposal of solid waste will be conducted must meet certain location standards. These include location restrictions on proximity of airports, floodplains, wetlands, fault areas, seismic impact zones, and unstable areas.	Applicable to any on-site repository constructed or to any existing off-site facility that receives these CERCLA hazardous substances.
Executive Order No. 11990 Protection of Wetlands	Yes		40 CFR § 6.302(a) and Appendix A	Minimizes adverse impacts on areas designated as wetlands.	Will be applicable if soil repository receiving the VB/I-70 soils is located in wetlands or has the potential to impact adjacent wetland areas.
Executive Order No. 11988 Floodplain Management	Yes		40 CFR § 6.302(a) and Appendix A	Pertains to floodplain management and construction of impoundments in such areas.	Will be applicable if soil repository receiving the VB/I-70 soils is located in floodplain.
Section 404, Clean Water Act (CWA)	Yes		33 USC 1251 et seq. 33 CFR Part 330	Regulates discharge of dredged or fill materials into waters of the United States.	Will be applicable if soil repository receiving the VB/I-70 soils is located in wetlands or has the potential to impact adjacent wetland areas.
Endangered Species Act	Yes		16 USC § 1531 et seq.; 50 CFR 200 and 402	Provides protection for threatened and endangered species and their habitats.	Due to the urban nature of the Site, threatened or endangered species are highly unlikely to be present. However, the Act would be applicable if endangered species were identified and affected by the selected remedial alternative.
Wilderness Act	No	No	16 USC 1311; 16 USC 668; 50 CFR 53; 50 CFR 27	Limits activities within areas designated as wilderness areas or National Wildlife Refuge Systems.	These types of areas are not present at the Site and therefore the Act is not an ARAR.

TABLE 17
POTENTIAL ACTION-SPECIFIC ARARS

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments
State Solid waste Regulations	Yes		6 CCR 1007, Section 1 6 CCR 1007, Section 2 6 CCR 1007, Section 3	A solid waste is any discarded material that is not excluded by 6 CCR 1007-3 Section 261.4 (exclusions) or that is excluded by variance granted under 260.30 and 260.31. These regulations provide the location, design, operating, closure, post-closure and maintenance criteria and requirements for facilities or sites receiving solid wastes.	Applicable to alternatives where contaminated soil is excavated and disposed in either an on-site or off-site facility. All substantive provisions of the State solid waste regulations will be met during the implementation of the remedial action. A permit or certificate of designation, however, will not be required for any on-site soil repository pursuant to CERCLA Section 121(e).
Determination of hazardous waste.	Yes		6 CCR 1007-2 Sect. 1.2 6 CCR 1007-3 Sect. 262.11 6 CCR 1007-3 Part 261.24	Wastes generated during soil excavation activities must be characterized and evaluated according to the following method to determine whether the waste is hazardous. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 milligrams per liter. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 milligrams per liter.	Applicable to alternatives where contaminated soil is excavated and disposed.
Disposal of excavated soils	Yes		CRS 25-15-320	An environmental covenant with the State of Colorado is required for any environmental remediation project	Applicable to alternatives where excavated soil is disposed at the Globe Plant site.

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments
at the Globe Plant site.				in which the relevant regulatory authority makes a remedial decision on or after July 1, 2001, that would result in either or both of the following: (a) Residual contamination at levels that have been determined to be safe for one or more specific uses, but not all uses; or (b) Incorporation of an engineered feature or structure that requires monitoring, maintenance, or operation or that will not function as intended if it is disturbed.	
State of Colorado v. ASARCO Consent Decree	No	No		The work plan accompanying this legal document establishes cleanup criteria for the Globe Plant Site that may be useful in developing the plan for placement of VB/I-70 soil if this receiving facility is chosen.	To-Be-Considered for alternatives where excavated soil is disposed at the Globe Plant Site to ensure the remedies are consistent.

Alternative 2 could be implemented with less risk to workers and the community than Alternatives 3, 4, 5, and 6. However, Alternative 2 provides a slightly lower level of short-term effectiveness than Alternative 3, primarily because tilling/treatment actions would be delayed while treatability testing was performed. Further, there would be some uncertainties about the immediate effectiveness of the tilling/treatment activities due to lack of data on lead concentrations with depth and at different locations in the targeted yards. Alternative 2 would require an amount of water equal to that required under Alternative 3.

Alternative 4 provides a slightly lower level of short-term effectiveness than Alternative 3. The additional soil removals at properties with arsenic EPCs greater than 128 ppm as provided in Alternative 4 would entail greater risks to the community due to the operation of heavy equipment in residential areas over a longer period of time and to truck traffic associated with transportation of excavated soil and import of clean backfill through neighborhood streets. Alternative 4 would require an estimated 20 million gallons of water to implement. This is twice as much water as estimated would be required by Alternatives 2 and 3.

Alternative 6 provides a lower level of short-term effectiveness than Alternative 4, primarily because additional soil removals at properties with arsenic EPCs greater than 70 ppm and with lead EPCs greater than 400 ppm would entail greater risks to the community. Increased short term risks are due to the larger scope of soil removal, which would require transportation of a larger volume of excavated soil and clean backfill through neighborhood streets by truck. Alternative 6 would require an estimated 43 million gallons of water to implement. This amount is 4 times as much water as estimated would be required by Alternatives 2 and 3.

Alternative 5 would provide the lowest level of short-term effectiveness because of increased risks to workers and the community due to the prolonged operation of heavy equipment in the residential areas. There would also be increased risk to the community from truck traffic associated with transportation of the largest volume of excavated soil and import of clean backfill (approximately 43,000 truck trips would be required). Alternative 5 would require an estimated 106 million gallons of water to implement. This amounts to 10 times more water than is estimated would be required by Alternatives 2 and 3. An additional consideration is that Alternative 5 does not include a Community Health Program component and so it is uncertain whether it would be effective in achieving the third RAO for arsenic in soil.

1.10.4 Long-Term Effectiveness and Permanence

To the extent that unacceptable health risks are associated with exposure to soil with high levels of arsenic and lead, Alternative 5 would provide the highest level of long-term protection and permanence because soils would be removed from the most properties, reducing the risk for the most people. Alternatives 6, 4, 3, and 2 would provide, in decreasing order, lower levels of long-term protectiveness. Alternative 2 would also provide slightly less long-term effectiveness compared to the alternatives with soil removal since the effectiveness of tilling and treatment is less certain than soil removal.

For arsenic, potential health risk where arsenic EPCs are below 240 ppm is associated with soil pica behavior. Screening level calculations suggest that removing and replacing soil below 240 ppm will not effectively protect children from the risk of acute effects since under at least one set of assumptions, the acute HQ is greater than 1 at background levels of arsenic. Also, children with soil pica behavior are at risk of experiencing other health risks unrelated to arsenic that will not be addressed by removing and replacing soil.

In the case of lead, Alternative 5 may not provide the highest overall protection since, in OU1, it is likely that there are other, non-soil sources of lead (such as lead-based paint), which would not be evaluated and addressed. Alternatives 2, 3, 4, and 6 would provide an equal level of long-term effectiveness by addressing soils with lead or arsenic EPCs above preliminary action levels of 240 ppm arsenic and 540 ppm lead by tilling and treatment and/or removal. The benefit of Alternatives 2, 3, 4, and 6 are that risks associated with non-soil sources of lead and with soil pica behavior would be effectively addressed by implementation of a Community Health Program under these alternatives. The additional benefit of the Community Health Program is that it would provide the community a mechanism to identify sources of lead exposure other than soils, and a means of addressing them (e.g., through lead paint abatement). Abatement of lead-paint would be accomplished by referral to another program. The Community Health Program would also provide a program to reduce the likelihood of soil pica behavior in children within VB/I-70 OU1 neighborhoods.

1.10.5 Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 3, 4, 5 and 6 do not contain a treatment component. Therefore, Alternative 2 would result in the highest reduction of toxicity and mobility due to treatment. However, there are uncertainties associated with the treatment process in achieving long-term RAOs. Site-specific testing would have to be performed to evaluate the chemical form and application rate of phosphate and to evaluate the overall treatment effectiveness once implemented.

1.10.6 Implementability

Alternatives 3, 4, 5 and 6 would be readily implementable with standard equipment and services, and adequate personnel would be readily available for this type of work. The construction technologies required to implement these alternatives are commonly used and widely accepted. For Alternative 2, tilling of residential soils may be difficult to implement. Areas of accessible soils within yards are relatively small and typically have features such as trees or large shrubs, which would make access and implementation of deep tilling difficult unless the features were removed and replaced. It is likely that due to access constraints, tilling would have to be performed using rototillers, which typically have a working depth of about 6 inches. Lead concentrations at depth have not been generated for the target properties and if deeper tilling were found to be necessary to meet the RAOs it would be difficult to implement.

1.10.7 Cost

Estimated costs for each alternative considered in the comparative analysis are shown below. These costs include direct and indirect capital costs and review costs for 30 years (there are no operation and maintenance costs associated with any of the alternatives).

Remedial Alternative	Net Present Worth Cost (Millions)
Alternative 2	10.6
Alternative 3	11.1

Alternative 4	17.5
Alternative 5	61.0
Alternative 6	31.1

1.10.8 State Acceptance

The State of Colorado supports the selected remedy, Alternative 6, as described in the New Proposed Cleanup Plan (May 2003). The State has worked closely with EPA and the community during the evaluation of cleanup options for the VBI70 Site and in the development of the Record of Decision. The State supports this cleanup because it is consistent with CERCLA and the NCP. Further, Alternative 6 directly addresses community concerns and offers a reasonable balance of cost and benefit for the citizens of Colorado. Further, the State notes EPA's selected remedy for OU1 of the VB/I-70 Site is consistent with the remedy and cleanup levels implemented at the adjacent, State-lead ASARCO Globe Site.

1.10.9 Community Acceptance

EPA conducted two public comment periods prior to issuing this Record of Decision. The first Proposed Plan was issued in May 2002 and considered Alternatives 1 through 5. During the public comment period associated with the Proposed Plan, EPA received extensive comment requesting that an alternative with lower arsenic and lead soil action levels than included in the preferred alternative, Alternative 4, be considered. Community representatives who participated in the VB/I-70 Working Group often expressed concern about the potential health effects of exposure to multiple chemicals in their immediate environment. This concern is related to the EJ nature of the Site, i.e., the community is disproportionately affected by environmental impacts from many sources other than the lead and arsenic in residential soils. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluated a new alternative, Alternative 6, which considered lower soil action levels. A revised Proposed Plan was issued in May 2003. During the public comment period associated with the revised Proposed Plan, extensive comment was received supporting Alternative 6, the revised preferred alternative. EPA selected Alternative 6 based on the overwhelming community support and acceptance for it.

Table 18 contains a summary of the comparative analysis of Alternatives 2 through 6.

TABLE 18
SUMMARY OF THE COMPARATIVE ANALYSIS

Evaluation Criterion	Alternative 2 Community Health Program, Tilling/Treatment (Lead), Targeted Removal and Disposal (Arsenic)	Alternative 3 Community Health Program, Soil Removal and Disposal	Alternative 4 Community Health Program, Soil Removal and Disposal	Alternative 5 Removal And Disposal	Alternative 6 Community Health Program, Soil Removal and Disposal
Threshold Criteria					
Overall Protection of Human Health	Yes, however there is some uncertainty with respect to treatment/tilling component	Yes	Yes	Yes, however there is uncertainty with respect to preventing acute exposures associated with soil pica behavior	Yes
Compliance with ARARs	Yes	Yes	Yes	Yes	Yes
Primary Balancing Criteria					
Short-Term Effectiveness	Less than Alternative 3 because implementation would be delayed to allow for treatability testing of tilling/phosphate treatment component and because of uncertainties associated with effectiveness of tilling/treatment	Highest level of short-term effectiveness	Less than Alternative 3 because of risks associated with soil removal for additional properties, and the use of additional water for replacement lawns	Lowest level of short-term effectiveness because of risks associated with soil removal for the most properties and the use of the most water for replacement lawns	Less than Alternative 4 because of risks associated with soil removal for additional properties and the use of additional water for replacement lawns
Long-Term Effectiveness and Permanence	Yes, however there is uncertainty regarding the effectiveness of tilling	Yes	Yes	Yes, however it would not provide information on other sources of lead. Would not reduce or prevent soil pica behavior.	Yes
Reduction of Toxicity, Mobility or Volume	Yes, but there is uncertainty regarding the effectiveness of tilling	No	No	No	No

Evaluation Criterion	Alternative 2 Community Health Program, Tilling/Treatment (Lead), Targeted Removal and Disposal (Arsenic)	Alternative 3 Community Health Program, Soil Removal and Disposal	Alternative 4 Community Health Program, Soil Removal and Disposal	Alternative 5 Removal And Disposal	Alternative 6 Community Health Program, Soil Removal and Disposal
Through Treatment					
Implementability	Yes, however studies are first required before the action can be designed	Yes	Yes	Yes	Yes
Cost	$10.6 million	$11.1 million	$17.5 million	$61.0 million	31.8 million
Modifying Criteria					
State Acceptance	No	No	Yes	No	Yes
Community Acceptance	No	No	No	Yes	Yes

1.11 Principal Threat Waste

The NCP states that, in general, "EPA expects to use treatment to address the principal threats posed by a site, whenever practicable." Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials" (40 CFR 300.430(a)(1)(iii)(A)). Contaminated soils at OU1 of the VB/I-70 Site are not considered contaminated with high concentrations of arsenic and lead, and these metals are relatively immobile in the environment. Therefore treatment of the OU1 soils is not expected by the NCP.

1.12 Selected Remedy

Based on the Comparative Analysis of Alternatives, the remedy selected for OU-1 of the VB/I-70 Site is Alternative 6. State and Community Acceptance were the overriding factors in selecting Alternative 6 as the remedy. The selected remedy consists of 3 components, a Community Health Program, soil removal, and sampling. A detailed description of each component of the remedy follows.

1.12.1 Community Health Program

The Community Health Program is composed of two separate, yet partially overlapping, elements. The first element will address risks to area children from non-soil sources of lead and from lead in soils above the action level of 400 ppm. The second element would be designed to address children with soil pica behavior to reduce their risks to arsenic in soil above 47 ppm, the preliminary action level determined in the Baseline Risk Assessment for children with soil pica behavior. Participation in one or both elements of the program would be strictly voluntary, and there would be no charge to eligible residents and property owners for any of the services offered by the community health program. The Community Health Program will be implemented on an ongoing basis until the residential soil removal portion of this remedial action has been completed. Each of these two main elements of the program is described below.

Community Health Program - Lead Exposure Risk Reduction

The program for reduction of lead risks is intended to be general. That is, it is intended to assess risks from lead from any and all potential sources of exposure, with response actions tailored to address the different types of exposure source that may be identified. The lead program will consist of three main elements:

1. Community and individual education about potential pathways of exposure to lead, and the potential health consequences of excessive lead exposure,

2. A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure, and

3. A program that provides a response to any observed lead exposure that is outside the normal range. This response will include any necessary follow-up sampling, analysis, and investigation at a child's

home to help identify the likely source of exposure. If the source of lead is found to be from residential soils, the property will receive a high priority for soil removal. If the main source is judged to be non-soil related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

Community Health Program - Arsenic Exposure Reduction, Soil Pica Behavior

The community health program for arsenic is designed to focus specifically on the potential risks to young children that exhibit soil pica behavior. Pica behavior is an rare behavior which children intentionally eat unusually large amounts of soil. The program for arsenic will consist of three main elements:

1. Community and individual education about identification and potential hazards of soil pica behavior and the potential health consequences of excessive acute oral exposure to arsenic.

2. A biomonitoring program by which any child may be tested to evaluate actual soil pica exposure to arsenic.

3. A program that provides a response to any observed inorganic arsenic exposures that are outside the normal range. This response will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure, and to implement an appropriate response that will help reduce the exposure. If the source of arsenic is found to be from residential soils, the property will receive a high priority for soil removal. If the main source is judged to be non-soil related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

1.12.2 <u>Soil Removal</u>

Soil removals will occur at properties that have lead or arsenic soil concentrations greater than the action levels. The action level for lead is exceeded when the average lead concentration from the three composite soil samples taken from the property is greater than 400 ppm. The action level for arsenic is exceeded when the highest arsenic concentration from the three composite soil samples taken from the property is greater than 70 ppm.

For properties which soil removal is conducted, all accessible soils will be removed to a depth of 12 inches. The excavation depth may be reduced in order to prevent damage to large trees or structures.

At the homeowner's request, flower beds and vegetable gardens may be sampled individually. If the concentrations of lead and arsenic in the flower beds or vegetable gardens are found to be below the action levels, then soil removal is not required in these areas. This is the only situation where a partial soil removal could occur at a property.

The excavation areas will be backfilled with clean soil containing arsenic and lead concentrations at or below action levels, and pre-remediation yard features restored. If sprinkler systems are present, the system will be removed and reinstalled. Based on Remedial Investigation data, it is estimated that soil removal would occur at a total of 853 residential properties within VB/I-70 OU1 (508 properties for arsenic only, 108 properties for both lead and arsenic, and 237 for lead only).

All excavated soils will be transported to a local solid waste landfill where they may be used as daily cover material. Alternatively, soils could be placed at the ASARCO Globe Plant Site to be used as cover and grading consistent with the provisions of the Statement of Work as set forth in the Final Consent Decree pursuant to State of Colorado vs. ASARCO, Civ. Action No. 83-C-2383 or as otherwise approved by the State. This facility may be off-site or may be the ASARCO Globe Plant. For purposes of this remedial action, and consistent with Section 300.400(e)(1) of the NCP, EPA may determined that the ASARCO Globe Plant is a suitable area in very close proximity to the contamination, which is necessary for the implementation of the response action. Further, since EPA notes that the ASARCO Globe Plant and the adjacent VB/I-70 OU1 neighborhoods are "reasonably related on the basis of geography", and since "the basis of threat or potential threat to the public welfare or welfare of the environment" are similar (i.e., smelter wastes containing, among other constituents, arsenic and lead), EPA has elected to treat the contiguous ASARCO Globe Plant as part of the VB/I-70 site for remediation purposes. Accordingly, a permit is not required for EPA to dispose of residential soil removed from yards within the Cole, Clayton, Swansea, or Elyria neighborhoods at the ASARCO Globe Plant. See, CERCLA Section 121(e). EPA also notes that depositing the VB/I-70 residential soils at the ASARCO Globe Plant will be protective of human health and the environment, will comply with all ARARs for the remedy selected at VB/I-70 OU1, and will accelerate the cleanup at that portion of the ASARCO Globe Site. Lastly, EPA believes disposal of the VB/I-70 residential soil at the ASARCO Globe Plant will enhance its prospects for future reuse as a commercial or recreational facility. Land use restrictions and/or controls will be imposed on the ASARCO Globe Plant to ensure that the soils deposited there as part of this cleanup will not pose a future risk in the event the Plant's current land use changes. The State's concurrence is contingent upon acceptance of the plan by the Globeville community. The State will be the lead agency for the soil placement and remediation of the ASARCO Globe Plant Site.

1.12.3 Sampling Program

Prior to this Record of Decision, approximately 75% of the residential properties within the VBI-70 Site boundary had been sampled for lead and arsenic. Because the spatial pattern of lead and arsenic contamination is variable throughout the Site, it is not possible to assess if a specific property requires a soil removal without data from that property. Therefore, a program of on-going soil sampling will be implemented at residential properties within the Site boundaries that have not already been adequately tested. This sampling program will continue through the completion of the soil removal portion of this remedy.

Soil sampling will also occur in a residential area adjacent to the Remedial Investigation study area not previously sampled. Data collected from the Remedial Investigation suggest this area may have been impacted by historic smelter emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if the soil is impacted by smelter related lead contamination and if soil removals are required.

The soil sampling program will begin with the identification of properties that require sampling. Once access has been obtained from the property owner to conduct the sampling, soil samples will be collected from the property and analyzed for lead and arsenic. The results will be provided to the property owner and evaluated to determine if a soil removal is needed. If a soil removal is needed, the property will be referred to the contractor conducting the soil removal.

1.13 Statutory Determinations

The Selected Remedy meets the mandates of CERCLA § 121 and the National Contingency Plan. The remedy is protective of human health and the environment. It complies with all Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy for OU1 of the VB/I-70 Site does not satisfy the statutory preference for treatment as a principal element of the remedy because the large volumes of soils contaminated with low levels of lead and arsenic can not be treated cost effectively, and treatment was not acceptable to the community.

If VB/I-70 soils are disposed of at the ASARCO Globe Plant, a 5-Year Review will be required. If the soils are disposed of off-Site, this remedy will not result in hazardous pollutants remaining on-Site above levels that allow for unlimited use and unrestricted exposures, and a 5-Year Review will not be required.

1.14 Documentation of Significant Changes

During the public comment period associated with the May 2002 Proposed Plan, EPA received extensive comment requesting that an alternative with lower lead, and to a lesser extent arsenic, soil action levels than included in the preferred alternative, Alternative 4, be considered. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluate a new alternative, Alternative 6, which considered soil removal action levels at properties with lead and/or arsenic concentrations of 400 ppm and 70 ppm, respectively. As a result of public comment on the original proposed plan, EPA decided to propose the new alternative as the preferred alternative. The Colorado Department of Public Health and Environment concurred with this decision. In compliance with statutory requirements for ensuring the public has the opportunity to comment on major remedy selection decisions, a new proposed plan was prepared presenting the new preferred alternative. The second proposed plan was made available to the public for comment in May 2003. No significant changes were made to the new proposed remedy.

2.0 RESPONSIVENESS SUMMARY

2.1 Stakeholder Comments and Lead Agency Responses

EPA conducted two public comment periods prior to issuing this Record of Decision. In May 2002, the original proposed plan was issued. A 60-day public comment period was held on this Proposed Plan that lasted from May 20, 2002 to July 19, 2002. Due to extensive comments received by EPA during this first public comment period requesting EPA consider a new alternative, EPA revised the Proposed Plan including a new alternative, Alternative 6. Alternative 6 was presented as the preferred alternative in the revised Proposed Plan, which was issued to the public in May 2003. Due to the significant changes to the preferred remedy, a 30 day public comment period was held on the revised Proposed Plan lasted from May 28 through June 26, 2003.

During the public comment periods, there were many comments provided on the May 2002 and May 2003 Proposed Plans. The comments had common themes addressing various elements of the selected remedies, and accordingly, have been summarized in accordance with these themes in order to provide an overall response. The comment summaries for each Proposed Plan and EPA's responses are provided herein.

2.1.1 May 2002 Proposed Plan

Public comments were provided verbally at three public meetings, and also in writing. The three public meetings held were:

- Harrington Elementary School on 6/20/02
- Swansea Recreation Center on 6/22/02
- St. Charles Recreation Center on 6/29/02

A public comment period was held from May 28 through June 26, 2003 on the May 2002 Proposed Plan. The following is a summary of the written and oral comments received during the public period and EPA's responses to the comments.

1. *Although there were several commentors who agreed with the clean up goals of Alternative 4, the preferred alternative, there were concerns that the cleanup goals for Alternative 4 were not sufficiently protective, and conversely, that the cleanup goals for Alternative 4 were over protective.*

Available information from the Baseline Human Health Risk Assessment and other EPA studies indicates that below 240 ppm arsenic and 540 ppm lead, soil is not a major source of exposure and risk at OU1. The arsenic level represents a cancer risk of 10^{-4}, which is within the CERCLA risk range of 10^{-6} to 10^{-4} for a final remedy. These arsenic and lead cleanup goals define the remedial actions for Alternatives 2 and 3, and cleanup to lower levels on the basis of risk is not warranted. Alternative 4 differs from these alternatives by adding soil removal from properties with arsenic concentrations greater than 128 ppm.

This alternative was developed and evaluated at the request of CDPHE. Specifically, CDPHE requested that EPA develop alternatives that would protect residents from cancer risks greater than a range of 3×10^{-5} to 8×10^{-5} to be consistent with cleanup objectives at the adjacent ASARCO Globe Site. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic Exposure Point Concentration (EPC) of 128 ppm corresponds to a point estimate risk level of 8×10^{-5}. The State of Colorado and several members of the community and the City and County of Denver supported the selected remedy, Alternative 4. State and community acceptance are important evaluation factors in remedy selection. However, because of additional community concerns regarding the cleanup goals of Alternative 4, a new alternative (Alternative 6) was developed and presented in the May 2003 Proposed Plan. Alternative 6 was chosen as the preferred alternative (see response to comment 1 for the May 2003 Proposed Plan).

2. *A few commentors were concerned over exterior lead-based paint continuing to cause lead contamination of the soil, and were concerned over interior lead-based paint and other sources of lead, e.g., lead pipes.*

A key component of the Community Health Program (if a child has abnormal blood lead levels) is that all potential sources of lead at the child's property would be sampled, including soil and interior/exterior paint. If soil lead sampling results demonstrate that a soil removal is required, EPA will make the soil removal at that property a priority. If the main source is judged to be non-soil related, responses may include approaches such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior LBP to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

3. *Several commentors expressed concern over the adequacy of the Community Health Program. Concerns included: the need to see a comprehensive community-based health program with biomonitoring so that the source of lead contamination can be determined for individuals; performance of a health study on the effect of exposure to arsenic contaminated soil to address the protectiveness of the arsenic standard; provision of adequate funding of the program to be successful (funds are insufficient - only one 3/4 time person for 4000 homes); and provision of appropriate outreach services to educate the community on these environmental health hazards.*

The Community Health Program addresses risks to area children from non-soil sources of lead. Also, it addresses children with soil pica behavior to reduce their risks to arsenic in soil. The program will consist of three main elements:

- Community and individual education about potential pathways of exposure to lead and arsenic, the potential health consequences of excessive lead and arsenic exposure, and identification of soil pica behavior;
- A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure to lead or arsenic; and

- A program that provides a response to any observed lead or arsenic exposure that is outside the normal range. This will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure. If the source of lead or arsenic is found to be from residential soils, the property will receive a high priority for soil removal. If the main source is judged to be non-soil related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

The budget for the Community Health Program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

4. *Several residents expressed concern that cancer or other illnesses they have contracted are a result of the lead and arsenic soil contamination on their properties.*

Contracting cancer or other illnesses by virtue of living in the area and being exposed to arsenic and lead in the soil is unlikely. The Baseline Human Health Risk Assessment indicates that no further action at the Site would be effective in preventing exposures to arsenic in soil above a $1x10^{-4}$ lifetime cancer risk, a chronic hazard quotient greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. With regard to lead (a non-carcinogen), when the IEUBK model is run using recently published data on soil ingestion rates for children, and the site-specific relative bioavailability and Site-specific soil/dust ratio adjustments are used, adequate protection is provided without further action at the site. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that remedial action may be necessary to meet the blood lead remedial action objective. Although there is a possibility that contracting an illness is related to exposure to lead and arsenic in the soil, the analyses that have been performed indicate that the possibility is very low.

5. *Several residents expressed concern that soil testing at untested properties and cleanup activities are moving too slowly.*

In 1997, CDPHE requested EPA's assistance in immediately responding to elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods. In response to the 1997 request from CDPHE, EPA immediately began work on what would become the VB/I-70 Site. EPA's first action at the Site was to mobilize an Emergency Response team to direct an extensive soil sampling effort and time critical removal actions in the area. The Emergency Response included an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties that were potential time critical removal candidates (remove and replace soil). The sampling occurred during March and April 1998. In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action for 37 properties. EPA then proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for a long-term response, EPA began the Remedial Investigation/Feasibility Study (RI/FS) in August 1998 as removal activities were underway. The RI/FS process was completed with the issuance of a Proposed Plan in May 2002. Because of community concerns regarding the preferred alternative in the Proposed Plan, a new Proposed Plan was issued in May 2003. EPA feels it has moved as expeditiously as possible while meeting all statutory requirements and the needs of the community.

6. *There were a few concerns that the extent of arsenic and lead contamination in soil has not been determined.*

In response to this concern, soil sampling will also occur in a residential area adjacent to the study area not previously sampled. Data collected to date suggest this area may have been impacted by historic smelter emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if soil removals are required and if the extent of the smelter related lead contamination extends further to the south of this area.

7. *One resident of the neighborhood was upset that there was no disclosure of contamination in the soil when he purchased the property.*

EPA has tried to inform all residential landowners within the Site of the sampling results of their properties. However, nothing in the Superfund law requires EPA or the sellers to disclose this information to someone seeking to buy properties within a Superfund site. State or local real estate laws or practices may cover this disclosure. EPA nonetheless is committed to working with all residential landowners, whether they bought their properties before the area became a Superfund site or after, to make sure the property, if it needs it, is cleaned up to landowner's satisfaction.

8. *A comment was made that twice as many properties could be cleaned up if only 6 inches of soil were removed rather than the 12 inches as proposed in the preferred remedy.*

During the Remedial Investigation, soil samples were collected at several locations at two-inch depth intervals from 0 to 12 inches total depth. While this data demonstrated that the highest concentrations of lead and arsenic occur in the 0 – 2 inch depth, levels of lead and arsenic above the clean up levels selected in this Record of Decision could be present at 6 inches depth. At 12 inches depth, the concentrations would likely be below the clean up levels established in this Record of Decision.

9. *One resident was concerned about breathing fugitive dust during cleanup operations.*

EPA is required to meet all applicable laws, including fugitive dust regulations, when it implements the remedy. The remediation contractor will conduct all remedial activities in accordance with these laws and a Health and Safety Plan that describes the health and safety requirements and guidelines designed to protect workers and other potentially exposed individuals. The plan will be designed to identify, evaluate and control health and safety hazards at the properties, and will follow promulgated EPA and OSHA regulations and industry standards. The plan will include an air monitoring and dust suppression programs which will be implemented during construction.

10. *Several comments were made with respect to the adequacy of the Environmental Justice (EJ) program for the Site. There were references to the cleanup not being more aggressive than at any other Superfund site, that the residents are not being heard or are being treated unfairly, and that EPA has had a demeaning attitude to some citizens at times.*

In August 1998, EPA formed a Working Group of stakeholders to provide an open forum for discussing all technical aspects of EPA's investigation, including the risk assessment and eventual cleanup alternatives. Through the working group, data and issues were discussed, allowing for community input into decision-making throughout the development and implementation of the remedial investigations, risk assessment, and feasibility study. The group has been meeting monthly since August 1998. The Working Group is EPA's response to the EJ concern of providing community members open and equal access to decision makers in EPA Region 8's Superfund Program. All aspects of EPA's remedial activities at the VB/I-70 site have been discussed in the Working Group forum to address the community's desire to have a voice in decisions that directly affect them. This level of community participation is much greater than at other non-EJ Superfund Sites. Also, community input was a significant factor in lowering the cleanup standards from those in Alternative 4 to those in Alternative 6, the preferred alternative. EPA apologizes if the views expressed by employees or contractors were interpreted as demeaning. The views of the citizens with the Site are very important to EPA, and we try to address those concerns as best we can given the legal and financial constraints imposed on us by the Superfund program.

11. *There were many requests for information that was not readily available, and some concerns that the Feasibility Study was missing some information on the Site's physical characteristics, the form of arsenic in the soil, and that the Site is part of the Environmental Justice program.*

EPA has strived to provide all information requested by the public. Although the Feasibility Study may not have provided all the information identified by the commentor, it did provide sufficient information to develop and evaluate the alternatives in accordance with CERCLA guidance.

12. *A few members of the public requested an extension to the public comment period.*

The public comment period was not extended for the revised Proposed Plan because of the amount of public comment already received by EPA on both Proposed Plans for the Site. Further, EPA tried to accommodate the other public comments requesting an acceleration of the cleanup work. Given these competing comments and interests, EPA though it appropriate not to extend the public comment period.

13. *A few commentors disagreed that properties where there are no children, or properties that include 4 or more dwellings would not be cleaned up regardless of the contamination.*

All properties - single family, multi-family, and apartments will be remediated where arsenic and lead are above the cleanup levels.

14. *One commentor requested that xeriscape should be offered as an alternative to conventional landscaping because of the drought condition in the Denver area.*

EPA will develop a landscaping plan with each property owner prior to soil removal. This landscaping plan will reflect the property owners preferences. In developing this plan, the homeowner will be provided with xeric alternatives such as wood mulch and rock landscaping materials instead of sod.

15. *One commentor was concerned with road damage from the construction traffic, and who would be responsible for repairs?*

Any road damage that occurs as a result of the remedial activities at VB/I-70 will be repaired and funded by EPA.

16. *The arsenic slope factor of (1.5 mg/kg-day)$^{-1}$ has been in the IRIS database since 1988. Data from current National Research Council reports, that are the basis for the new arsenic Maximum*

Contaminant Level (MCL) of 10 μg/l, indicate a slope factor of (7.0 mg/kg-day)$^{-1}$ is more appropriate, and should be both qualitatively and quantitatively discussed in the Baseline Human Health Risk Assessment.

As discussed in the Baseline Human Health Risk Assessment, the current oral slope factor for arsenic (1.5 (mg/kg-d)$^{-1}$) is based on skin cancer only. EPA recognizes that although arsenic does increase the risk of several other types of cancer (namely, those of the urinary bladder and lung), this slope factor is not necessarily inappropriate. If cancers of the lung and bladder are very unlikely to occur in an individual that does not also develop skin cancer, then the slope factor for skin cancer and for all cancers combined are essentially identical. Several alternative approaches for quantification of cancer risk at low doses have been reviewed by the (NRC 1999). It was noted that the risk estimates depend heavily on the mathematical approach employed as well as the cancer data set utilized. For example, based on the incidence of urinary bladder cancer in males in Taiwan, several different methods yielded estimates of the EC01 (the concentration in water that results in a 1% increase in excess lifetime cancer risk) of about 400 - 450 μg/L. If the dose response curve is assumed to be linear and to have no threshold, this corresponds to an oral slope factor of about 0.8 - 0.9 (mg/kg-day)$^{-1}$, slightly lower than the EPA value that is based on skin cancer.

Additionally, several alternative risk models have been used to analyze urinary bladder and lung cancer incidence in the Taiwanese populations exposed to arsenic-contaminated drinking water (Morales *et al.* 2000). After reviewing these models and consulting with the authors, EPA concluded that a concentration of 10 μg/L in water would yield estimates of excess cancer risk of 0.6E-04 to 3.0E-04 for an average individual and from 1.3E-04 to 6.1E-04 for an individual at the 90th percentile of the risk distribution (EPA 2001d). These risk estimates are similar to the risk estimates derived previously by USEPA and by (NRC 1999). Therefore, the current slope factor of 1.5 (mg/kg-day)$^{-1}$, although based on the incidence of skin cancer, is also likely to be generally appropriate for estimation of risks from cancers of the urinary bladder and lung. Nevertheless, the implications of a higher slope factor were addressed qualitatively by selecting the proposed value of 70 ppm for arsenic for Alternative 6 in the May 2003 Proposed Plan

17. *In the Baseline Human Health Risk Assessment, Dr. Robert Benson's report is cited for establishing an acute reference dose for arsenic of 0.015 mg/kg-day, which is used in setting the preliminary action level of 47ppm to be protective of a child with pica behavior. Considering the many uncertainties regarding the study used to establish 0.015 mg/kg-day, why was equal consideration was not given to selecting an acute RfD of 0.005 mg/kg-d, which is supported by the ATSDR and a FIFRA Scientific Advisory Panel.*

The Baseline Human Health Risk Assessment does present ATSDR's alternative RfD value, and does provide a set of calculations using this value. However, ATSDR considers that this value is a screening level RfD, and EPA believes the value of 0.015 mg/kg-day is adequate to reliably characterize risks from subchronic and acute exposures to arsenic.

18. *In the uncertainty evaluation section of the Baseline Human Health Risk Assessment, there is no mention of recent studies that indicate 10 μg/dL of blood lead may not be sufficiently protective, as acknowledged by the CDC. A study by Lanphear in 2000 indicates 5 μg/dL or lower is more*

acceptable.

The Baseline Human Health Risk Assessment does address this issue, stating:

> "It is currently difficult to identify what degree of lead exposure, if any, can be considered safe in young children. Some studies report subtle signs of lead-induced neurobehavioral effects in children beginning at blood lead levels around 10 µg/dL or even lower, with population effects becoming clearer and more definite in the range of 30-40 µg/dL (CDC 1991, ATSDR 1999). On the other hand, some researchers and clinicians believe the effects that occur in children at low blood lead levels are so minor that they need not be cause for concern. After a thorough review of all the data, the EPA has identified 10 µg/dL as the blood lead level at which effects that warrant avoidance begin to occur, and has set as a goal that there should be no more than a 5% chance that any child will have a blood lead value above 10 µg/dL (EPA 1994). This approach focuses on the risks to a child at the upper bound (about the 95th percentile) of the exposure distribution, very much the same way that the approach used for other chemicals focuses on risks to the RME individual. The Centers for Disease Control (CDC) has also established a guideline of 10 µg/dL in preschool children which is believed to prevent or minimize lead-associated cognitive deficits (CDC 1991)."

19. *EPA should clarify the manner in which it will consider the likelihood that children in the VB/I-70 study area have an elevated baseline blood lead concentration from non-soil sources such as lead paint. EPA should indicate how it will consider cumulative lead exposure in devising, implementing, and verifying the effectiveness of the remedy. EPA should revise the FSR and its presentation of a preferred alternative to explicitly discuss how Environmental Justice concerns have been factored into the design and selection of the remedy in light of the cumulative lead exposure, a recent cancer study by CDPHE (2001) that indicates adults within the VB/I-70 community may have increased exposure or vulnerability to other lung carcinogens, and the increased vulnerability of African-American and Hispanic children because they suffer from greater iron deficiency compared to white children, a condition that may be at least additive with lead poisoning in having adverse impacts on neurocognitive development. EPA should analyze whether existing mechanisms for detection and abatement of lead-based paint within the VB/I-70 community have adequate scope and funding to reduce the vulnerability of the community's children to this component of cumulative lead exposure, and in so doing, examine its authority under Section 104(a)(4) of CERCLA for mitigation of this non-soil source of lead. EPA should examine whether direct EPA support for lead paint abatement is warranted to help EPA achieve, in what may be a cost-effective manner, a remedial action plan for lead that incorporates the impact of cumulative lead exposure.*

The basic method that EPA uses to evaluate risks from lead does consider cumulative exposures from all sources, including lead released to soil and dust from lead-based paint. Because Superfund does not have authority to respond to risks from direct ingestion of lead paint, this pathway is not included. It should be noted that the results of the community-wide survey of childhood blood lead levels do not indicate that the frequency of elevated blood lead values in area children is higher than EPA's health-based goal.

20. *Justification for the selection of a GSD value of 1.2 would be enhanced if EPA could provide a statistical analysis of the parameters used in the IEUBK model that reveals that the overestimation inherent in the default value of 1.6 quantitatively supports a revised value of 1.2. A GSD value of 1.2 reported for the ISE model was derived using an age range for childhood exposure of 1-84 months, which is somewhat inconsistent with the remedial action objective for lead in soil stated on page 2 of the Feasibility Study Report, which cites an age range of less than 72 months.*

The Baseline Human Health Risk Assessment does present this analysis. In brief, it is well established in statistical theory that the between-child variation in blood lead level on any given day of observation will be larger than the variation in the long-term average blood lead values for each child. The ISE model illustrates that the expected GSD for short-term observations is about 1.6, and that a value of about 1.2 is expected if the long-term average is used. There is only a small difference between the long-term average for 1-84 months versus 1-72 months.

21. *Can EPA report how many of the properties require soil removal because of the cancer risk from RME soil exposure alone, and how many because of the combined cancer risk of RME soil exposure plus CTE garden vegetable consumption?*

Calculations already presented in the Baseline Human Health Risk Assessment indicate that the frequency of properties that exceed EPA's risk-based target of 1E-04 for arsenic is about 3.1% based on RME soil exposure alone, and about 3.3% based on RME soil exposure plus CTE vegetable ingestion.

22. *Can EPA examine and comment on whether the rate of participation in the nearby Globeville biomonitoring program provides confidence that a somewhat similar program for VB/I-70 will achieve an acceptable participation rate? At moderate dose levels, the half-time of arsenic excretion via the urine is a matter of a few days to a week. Can EPA provide a statistical power analysis that examines the feasibility of a urine arsenic biomonitoring program for detecting, with an acceptable degree of confidence, the true prevalence or incidence of elevated arsenic exposure from soil-pica behavior? What criteria would EPA apply to assess whether health education was an acceptable remedy for reduction of soil pica behavior?*

EPA has performed a number of calculations to estimate the ability of a community study of urinary arsenic values to detect cases of pica. If pica is considered to be any single high intake of soil by a child, and if it is assumed that a child will engage in this behavior very rarely (*e.g.*, once per childhood), then the chances of observing the event in the study are low. However, EPA is much less concerned with a child who eats a mouthful of soil only once during childhood than with the child who ingests large amounts of soil fairly often. This is the true definition of pica, and children with this behavior have a much higher risk of experiencing an acute dose of concern. The ability of a community-wide survey of urinary arsenic levels to detect this type of activity depends on the fraction of all children who engage in this activity. If the behavior is common, the study has a high chance of observing the effect. If it is very rare, the study has low power to detect the effect. It should be noted that after the collection of more than 1500 urinary arsenic samples, very few cases of potential pica exposure to soil were detected. This means that the health risks posed by ingestion of arsenic due to soil pica are apparently either very infrequent and/or are of relatively low magnitude.

23. *Can EPA explain how it proposes to utilize the results of the blood lead monitoring program to assess the effectiveness of the CHP in meeting the RAO for lead? What criteria will be employed in the assessment? How will the relative contribution of lead in soil and paint be determined, particularly when lead is present in both media? What level of participation in the biomonitoring program will be necessary to detect this level of success with confidence?*

The CHP is intended to provide a service to the community during the time that remedial activities are occurring, and data from the study will not be used as a criterion for evaluating compliance with the RAO for lead. Compliance with the RAO will be achieved by soil removal. The CHP will provide a response to any observed lead or arsenic exposure that is outside the normal range. This will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure.

24. *By what criteria will EPA judge the CHP to have successfully contributed to a permanent remedy that persists after the CHP is discontinued?*

The CHP is intended to provide a service to the community during the time that remedial activities are occurring. The permanence of the remedy is achieved by removal of contaminated soil with arsenic and lead levels that are above the cleanup levels.

25. *To what extent will the effectiveness of the CHP developed by EPA be dependent on the continued existence of these state and local programs? Will EPA provide funding, above and beyond that envisioned for the VB/I-70 CHP alone, to assure the long-term stability and existence of the state and local lead hazard reduction programs?*

As stated in the response to comment 23, the CHP is intended to provide a service to the community during the time that remedial activities are occurring. The permanence of the remedy is achieved by removal of contaminated soil with arsenic and lead levels that are above the cleanup levels. The awareness of the community to arsenic and lead hazards, and on-going biomonitoring will be dependent on the continued existence of state and local programs; however, their continued existence is not part of the remedy and the EPA Superfund Program cannot provide the funding for the programs. EPA is not aware that there is, or will be, a funding problem with these programs.

26. *EPA should present a relatively detailed narrative that explains how the seemingly modest level of subject recruitment, case management, and residential investigations set forth in the budget will constitute a CHP sufficient to assure that the public health needs of the community are addressed.*

The budget for the community health program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

27. *The results of the University of Colorado Health Sciences Center study of childhood soil contact, and*

arsenic and lead exposure in the VB/I-70 study area will contribute to a greater understanding of the risks posed at this site and the capacity of a biomonitoring program to effectively assess the situation.

EPA agrees the University Of Colorado Health Sciences Center (UCHSC) study is very important in understanding of the risks posed at this site and the capacity of a biomonitoring program to effectively assess the situation, and has utilized the results in planning the monitoring program for the site. The UCHSC has not yet released results of the Kids At Play survey, but will prepare a report to the Colorado Department of Public Health and Environment (CDPHE) and ATSDR to provide those results. As the agency performing the chemical analyses of the biological samples, EPA has access to blood lead and urinary arsenic test results from the Kids At Play survey. These results have been useful for development of the Community Health Program design and are presented in general terms here. Importantly, the information presented here should not be cited as the final results or conclusions of the Kids At Play study. However, unless the UCHSC/CDPHE's final analysis proves otherwise, given the apparently high participation rates, EPA presents the following preliminary conclusions.

The Kids At Play survey collected a total of nearly 1600 blood lead samples and nearly 1400 urinary arsenic samples for testing at EPA's contracted laboratory. Samples were collected mainly from young children, but some of the participants were older than 72 months (6 years). The UCHSC is currently preparing a detailed summary of analysis of the results, but this report is not yet available. However, by virtue of having performed the analyses, EPA is able to calculate preliminary summary statistics for the study. Because the UCHSC report is not finalized, these data should be considered draft and should not be cited as the final results or conclusions of the Kids At Play survey.

Based on the data set of all original samples, approximately 5% of the blood lead test results were greater than or equal to 10 μg/dL. Participants with blood lead values greater than 10 μg/dL were retested, and most of these repeat values were also higher than 10 μg/dL. The results from the retests indicate that less than 4% of children tested have confirmed elevated blood lead levels. These preliminary data suggest that the current incidence of elevated blood lead levels in children who reside within the VB/I-70 site is approximately the same as reported by CDPHE (6%) for children under six years tested during 2000 (CDPHE 2001a) and somewhat lower than reported by the Centers for Disease Control and Prevention's (CDC's) National Health and Nutritional Evaluation Survey (NHANES) and local health agencies for similar, older urban communities in the northeastern and Midwestern United States within the last five years (CDC 2000, City of St. Louis Department of Health 2000).

Based on the data set of all original samples, less than 1% of the urinary arsenic values were above 30 μg/L. Participants with urinary arsenic values above 30 μg/L were also retested, and nearly all of these were below 30 μg/L in the repeat test. At present, data are insufficient to judge if this pattern is significantly different than expected for other similar urban locations, but the results suggest that elevated arsenic exposures at VB/I-70 are both infrequent and intermittent.

28. *The arsenic cleanup level needs to be lowered. At an average arsenic concentration of 128 ppm, portions of the yard could contain arsenic as high as 800 ppm, and consumption of this higher contaminated soil by a child with soil pica behavior will exceed the dose known to cause a variety of*

adverse health effects. Testing of a child's urine for arsenic still allows the child to potentially have serious arsenic exposure before EPA would take action. The cleanup levels need to be more stringent than proposed for Alternative 4 but not as stringent as Alternative 5.

EPA agrees that health risks from arsenic ingestion due to soil pica behavior may exist at the proposed action level of 128 ppm (yard-wide average), but emphasizes that these risks are entirely hypothetical and very uncertain. This is because the actual soil intake rates and absorption rates from soil pica are not known, nor are the frequencies of such behaviors or the probability that pica events will actually occur at arsenic hot spots. In calculating the risk of acute effects from exposures to arsenic associated with soil pica behavior in children, EPA considered several sources of uncertainty: 1) the distribution of soil ingestion rates for children with soil pica behavior is not known; and 2) the frequency with which such children exhibit soil pica behavior is also not known. Therefore, the application of Monte Carlo techniques to analyze the uncertainty in the calculations of acute risk is difficult and was not performed by EPA for the VB/I-70 Site.

However, EPA characterized the theoretical average and Reasonable Maximum Exposure (RME) point estimates of acute risk in screening level calculations. These estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in an acute hazard quotient greater than 1 for the average soil pica scenario. There are between 662 and 1841 individual properties with soil arsenic concentrations that are predicted to result in an acute hazard quotient greater than 1 for the RME soil pica scenario. The wide range of potentially affected properties, 294 - 1841, reflects the substantial uncertainty in quantifying these risks.

EPA guidance (OSWER Directive 9355.0-30) states that where the non-carcinogenic hazard quotient for an individual based on the Reasonable Maximum Exposure (RME) for both current and future land use is less than 1, action generally is not warranted. EPA considered the range of 662 – 1841 properties where application of this guidance indicated remedial action is warranted. This range is referred to as Case 1 (1841 properties) and Case 2 (662 properties) in the Baseline Human Health Risk Assessment. EPA also considered the following: 1) EPA is not aware of any reported cases of acute arsenic toxicity attributable to ingestion of arsenic in soil; 2) limited data on urinary arsenic levels in residents of the VB/I-70 area and the nearby Globeville neighborhood do not reveal the occurrence of high soil intakes by children; 3) inquiries by the CDPHE into reports of known or suspected cases of arsenic poisoning in the community surrounding the VB/I-70 site resulted in their conclusion, stated in a July 25, 2001 letter, that "... it appears that there is no obvious or identifiable problem of arsenic exposure from environmental sources in the area of concern" (CDPHE 2001). Additionally, in the summer of 2001, a community health study known as the "Kids At Play" survey was conducted within the VB/I-70 Site by the CDPHE and the University of Colorado Health Sciences Center (UCSHC). The survey was funded through a grant from ATSDR. The door-to-door survey included: 1) a census of resident children less than 6 years old; 2) a questionnaire about child behaviors related to soil contact; 3) collection of blood samples for lead analysis and urine samples for arsenic analysis. To date, nearly 1400 children have participated in the Kids At Play survey. Preliminary results indicate that less than 1% of children tested have initial urinary arsenic levels greater than 30 μg/L, a level that ATSDR considers to be within normal levels. Upon repeat sampling, nearly all of these children had urinary arsenic levels below 30 μg/L.

These considerations suggest that arsenic risk from soil pica behavior may not be as significant as the theoretical calculations suggest. However, because of the high uncertainty regarding the magnitude and frequency of soil pica behavior, more reliable risk estimates for this scenario will not be possible until better data are collected on soil intake rates characteristic of soil pica behavior along with direct measurements of soil–related exposure to arsenic. EPA also notes that reducing the soil action level for arsenic is not likely to entirely eliminate the hypothetical risks from soil pica behavior. Nevertheless, EPA has chosen to accept recommendations to lower the action level for arsenic in soil to 70 ppm. Increased soil removal coupled with the educational components of the Community Health Program should help reduce risks to children with soil pica behavior.

29. *The arsenic cleanup level of 128 ppm is not sufficient to reduce the risk of cancer because 1) the level is based on the bioavailability of arsenic from a singe swine study where there were technical problems with the control pigs; 2) only 5 soil samples were used from the study area; 3) the 95% upper confidence limit of bioavailability may not account for all variability in this parameter; 4) the swine study was not critically reviewed; 5) 30 years was used to estimate cancer risks when in fact some residents live in the neighborhood for longer periods of time; 6) the assumption was made that half of the soil exposure came from indoor dust which is based on a single study; and 7) a whole house indoor dust sample was used to estimate indoor dust exposure.*

EPA disagrees with the commentor's assumptions. First, the basic design of the swine study protocol has undergone peer review, and there were no important technical problems with the conduct of the swine study. Testing of "only" five soil samples from the site provides a much more extensive characterization of site-specific RBA than has ever been performed at any other site, and use of the 95% UCL of the site-wide average RBA is very likely to provide a conservative estimate of the true site-specific RBA. Use of 30 years as the RME exposure duration is an EPA national standard for human health risk assessment, and the text already acknowledges that risks could be higher for individuals who do reside at the site for longer AND who also ingest high amounts of soil over that entire period. Use of a "whole house" composite sample of dust to characterize indoor dust exposure is fully consistent with the fact that cancer risk from arsenic is based on long-term average exposures, and that long-term average exposure is related to average concentration in a medium, not in a random grab sample (which may be either too low or too high). While data are limited on the fraction of total soil plus soil that is derived from dust, the default value is based on the best data available, and ATSDR offers no additional information.

30. *The cleanup goal for arsenic of 128 ppm is inconsistent with the cleanup goals for other Region 8 Superfund sites, with goals as low as 35 ppm. The adjacent Globeville Superfund Site had a cleanup level of 70 ppm.*

EPA establishes the action levels for the contaminants of concern based on the best available science and the best site-specific data available. EPA has numerous studies and investigations in developing the proposed action level for arsenic at OU1 of the VB/I-70 Site of 128 ppm. Nevertheless, based on State and public comment, EPA has chosen to reduce the action level for arsenic to 70 ppm in order to maintain consistency with decisions at the Globe Superfund Site.

31. *The lead cleanup level of 540 ppm is much higher than the cleanup level for the Eureka Mills*

Superfund Site of 231 ppm, largely because a geometric standard deviation (GSD) of 1.2 was used rather than 1.4. In fact, the default GSD value of 1.6 is recommended in the IEUBK Guidance Manual unless there are great differences in child behavior and lead biokinetics at a particular site. Supporting data is not provided by EPA for the use of a GSD of 1.2.

The Baseline Human Health Risk Assessment demonstrates that a short-term GSD of 1.6 is likely to be equivalent to a long-term GSD of about 1.2 (the long-term value is what the IEUBK model requires). Also, the Baseline Human Health Risk Assessment provides the results of a range of alternative risk calculations, and the central range of those calculations was used to identify a protective action level. Nevertheless, EPA has decided to lower the action level for lead to 400 ppm, in part to account for the uncertainties in the lead risk assessment process, and in response to public comment on the originally proposed action level for lead.

32. *To be effective, the CHP requires not only educational activities but also developing advocacy groups, changing local policy to support educational activities, developing economic support for the program, developing engineering controls to reduce pollution, and developing a comprehensive program to address the problem at multiple levels. EPA should evaluate the Ruston North Tacoma CHP for input to the VB/I-70 OU1 CHP, and should consider more funding to improve effectiveness. Also, the CHP should be developed jointly with community representatives. This will improve participation in the biomonitoring program, which is necessary to identify children with exposure to arsenic and lead.*

The scope of the CHP has not been fully determined at this time. Community input will continue to be used in defining this program, as will the results of other programs.

33. *It is requested that EPA develop and evaluate an additional alternative which includes developing lower cleanup levels for arsenic and lead, involving the community representatives in the development of new cleanup levels and the CHP, evaluating similar programs at other sites, and implementing a CHP that will be in place until cleanup is finished.*

In consideration of these elements of a remedy, Alternative 6 was developed and presented in the May 2003 Proposed Plan as the preferred alternative.

The following individuals addressed EPA at the public meetings in order to be recognized as a concerned citizen and/or member of a concerned organization.

Kara Piccirilli	Colorado Peoples Environmental and Economic Network
Rose Prieto	Latin American Research Services Agency
Terry Smith	Youth Wise
Tafari Lumumba	Clayton Neighborhood Association
Sandra Douglas	Cole Neighborhood Association
Lorraine Granado	CEASE
Joan Hooker	CEASE

2.1.2 May 2003 Proposed Plan

Public comments were provided verbally at two public meeting and in writing. The two public meetings were:

- Swansea Recreation Center on 6/19/03
- Harrington Elementary School on 6/21/03

A public comment period was held from May 28 through June 26, 2003 on this proposed plan. The following is a summary of the written and oral comments received during the public period and EPA's responses to the comments.

1. *Although many commentors agreed with the cleanup goals of Alternative 6 (the preferred alternative), there were concerns that the cleanup goals were not sufficiently protective, and conversely, that the cleanup goals for Alternative 6 were over-protective, i.e., the goals do not offer additional risk reduction relative to the goals of Alternative 4 (as stated in the May 2002 Proposed Plan) but result in greater expenditure of federal money and classification of many properties as contaminated, thus devaluing the properties. One commentor stated that there should be a range of concentrations below the current cleanup goal where the option exists for a homeowner to have the soil replaced in the yard because of the uncertainty in establishing the goal, and another commentor requested grants for cleanup of properties that were below the cleanup goals.*

Alternative 6 differs from Alternatives 2, 3, and 4 (see response to Comment 1 on the May 2002 Proposed Plan) by adding soil removal from properties with arsenic Exposure Point Concentrations (EPCs) greater than 70 ppm and/or lead EPCs greater than 400 ppm. This alternative was developed and evaluated in response to comments received on the May 2002 Proposed Plan. Those comments requested an explanation of why EPA was not considering removing soil from properties where arsenic exceeds 70 ppm (represents a 5×10^{-5} cancer risk) as was done at the ASARCO Globe Site, and where lead exceeds 400 ppm to be consistent with EPA's screening level for lead in soil. Cleanup of arsenic to lower concentrations would partly address children with soil pica behavior; however, it is noted that these children are at risk of experiencing other health risks unrelated to arsenic that will not be addressed by removing and replacing the soil. Cleanup to lower concentrations of lead may not reduce health risks because results from the Kids At Play survey indicate that of the nearly 1600 children who have participated in the survey, less than 4% of children tested had unacceptable blood lead levels. However, EPA decided to lower the action levels of lead and arsenic to respond to the community's request.

2. *A few commentors were concerned over exterior lead-based paint continuing to cause lead contamination of the soil.*

A key component of the Community Health Program (if a child has abnormal blood lead levels) is that all potential sources of lead at the child's property would be sampled, including soil and interior/exterior paint. If soil lead sampling results demonstrate that a soil removal is required, EPA will make the soil removal at that property a priority. If the main source is judged to be non-soil related, responses may include approaches such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

3. *Several commentors expressed concern over the adequacy of the Community Health Program. Concerns included: the need to see a comprehensive community-based health program with biomonitoring so that the source of lead contamination can be determined for individuals; performance of a health study on the effect of exposure to arsenic-contaminated soil to address the protectiveness of the arsenic standard; provision of adequate funding of the program to be successful; and provision of appropriate outreach services to educate the community on these environmental health hazards.*

The Community Health Program addresses risks to area children from non-soil sources of lead. Also, it addresses children with soil pica behavior to reduce their risks to arsenic in soil. The program will consist of three main elements:

- Community and individual education about potential pathways of exposure to lead and arsenic, the potential health consequences of excessive lead and arsenic exposure, and identification of soil pica behavior;
- A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure to lead or arsenic; and
- A program that provides a response to any observed lead or arsenic exposure that is outside the normal range. This will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure. If the source of lead or arsenic is found to be from residential soils, the property will receive a high priority for soil removal. If the main source is judged to be non-soil related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

The budget for the Community Health Program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

4. *Several residents expressed concern that cancer or other illnesses they have contracted is a result of the lead and arsenic soil contamination on their properties.*

Contracting cancer or other illnesses by virtue of living in the area and being exposed to arsenic and lead in the soil is unlikely. The Baseline Human Health Risk Assessment indicates that no further action at the Site would be effective in preventing exposures to arsenic in soil above a $1x10^{-4}$ lifetime cancer risk, a chronic hazard quotient greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. With regard to lead (a non-carcinogen), when the IEUBK model is run using recently published data on soil ingestion rates for children, and the site-specific relative bioavailability and Site-specific soil/dust ratio adjustments are used, adequate protection is provided without further action at the site. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that remedial action may be necessary to meet the blood lead remedial action objective. Although there is a possibility that contracting an illness is related to exposure to lead and arsenic in the soil, the analyses that have been performed indicate that the possibility is very low.

5. *Several residents expressed concern that soil testing at untested properties and cleanup activities are moving too slowly.*

In 1997, CDPHE requested EPA's assistance in immediately responding to elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods. In response to the 1997 request from CDPHE, EPA immediately began work on what would become the VB/I-70 Site. EPA's first action at the Site was to mobilize an Emergency Response team to direct an extensive soil sampling effort and time critical removal actions in the area. The Emergency Response included an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties that were potential time critical removal candidates (remove and replace soil). The sampling occurred during March and April 1998. In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action for 37 properties. EPA then proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for a long-term response, EPA began the Remedial Investigation/Feasibility Study (RI/FS) in August 1998 as removal activities were underway. The RI/FS process was completed with the issuance of a Proposed Plan in May 2002. Because of community concerns regarding the preferred alternative in the Proposed Plan, a new Proposed Plan was issued in May 2003. EPA feels it has moved as expeditiously as possible while meeting all statutory requirements and the needs of the community.

6. *There were a few concerns that the extent of arsenic and lead contamination in soil has not been determined.*

In response to this concern, soil sampling will also occur in a residential area adjacent to the study area not previously sampled. Data collected to date suggest this area may have been impacted by historic smelter emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if soil removals are required and if the extent of the smelter related lead contamination extends further to the south of this area.

7. *One resident of the neighborhood was upset that there was no disclosure of contamination in the soil when he purchased the property.*

EPA has tried to inform all residential landowners within the Site of the sampling results of their properties. However, nothing in the Superfund law requires EPA or the sellers to disclose this information to someone seeking to buy properties within a Superfund site. State or local real estate laws or practices may cover this disclosure. EPA nonetheless is committed to working with all residential landowners, whether they bought their properties before the area became a Superfund site or after, to make sure the property, if it needs it, is cleaned up to landowner's satisfaction.

8. *A comment was made that twice as many properties could be cleaned up if only 6 inches of soil*

were removed rather than the 12 inches as proposed in the preferred remedy.

During the Remedial Investigation, soil samples were collected at several locations at two-inch depth intervals from 0 to 12 inches total depth. While this data demonstrated that the highest concentrations of lead and arsenic occur in the 0 – 2 inch depth, levels of lead and arsenic above the clean up levels selected in this Record of Decision could be present at 6 inches depth. At 12 inches depth, the concentrations would likely be below the clean up levels established in this Record of Decision.

9. *One resident was concerned about breathing fugitive dust during cleanup operations.*

EPA is required to meet all applicable laws, including fugitive dust regulations, when it implements the remedy. The remediation contractor will conduct all remedial activities in accordance with these laws and a Health and Safety Plan that describes the health and safety requirements and guidelines designed to protect workers and other potentially exposed individuals. The plan will be designed to identify, evaluate and control health and safety hazards at the properties, and will follow promulgated EPA and OSHA regulations and industry standards. The plan will include an air monitoring and dust suppression programs which will be implemented during construction.

10. *One commentor requested that xeriscape should be offered as an alternative to conventional landscaping because of the drought condition in the Denver area.*

EPA will develop a landscaping plan with each property owner prior to soil removal. This landscaping plan will reflect the property owners preferences. In developing this plan, the homeowner will be provided with xeric alternatives such as wood mulch and rock landscaping materials instead of sod.

11. *One commentor was concerned with road damage from the construction traffic, and who would be responsible for repairs?*

Any road damage that occurs as a result of the remedial activities at VB/I-70 will be repaired and funded by EPA.

12. *One commentor was concerned that, because of the possible presence of hot spots of contamination on the property, taking an average concentration was not the best metric to determine compliance with the cleanup standard.*

Except under very special conditions, health risks from arsenic and lead are dependent on the long-term average exposure level, and long-term average exposure is a function of the area-wide average concentration. The composite soil sampling approach was optimal for characterizing the yard wide average concentrations of arsenic and lead. However, because community representatives and other members of the Working Group were concerned that the composite samples might dilute hot spots within a yard, EPA devised a method to <u>predict</u> hot spots using the composite results. If the prediction method indicated there may be unacceptable short-term risk, 30 individual grab samples were collected to further characterize potential hot spots.

13. *One commentor expressed an opinion that it would be cost-effective to clean up entire blocks regardless of contamination levels that would also reduce a child's exposure to contamination from neighbors.*

Although it may appear to be cost effective to cleanup entire blocks, hundreds of additional uncontaminated properties would receive soil removal although there was no human health risk. Superfund monies, however, cannot be spent unless there is a release or threat of release of a hazardous substance. Further, since each property is being remediated individually, there would be little cost savings from cleaning up the Site on a block-by-block basis rather than a house-by-house basis.

14. *One commentor requested that the Proposed Plan indicate that the properties south and west of the convergence of Blake and Downing Streets that test higher than the cleanup goals for Alternative 6 will be cleaned up.*

The EPA National Remedy Review Board recommended that the northern portion of the Curtis Park Neighborhood be investigated to determine if soils in this neighborhood were impacted by lead due to smelter related areal emissions. All properties included within the expanded Site boundaries in the Curtis Park Neighborhood will be eligible for soil removal if the action level is exceed for lead or arsenic.

15. *In the discussion of Alternative 6 contained in the addendum to the Feasibility Study report issued on December 20, 2002, EPA notes that notwithstanding their preference for Alternative 6, the more stringent clean-up levels it contains in comparison to the prior preferred plan are not necessary to achieve the Remedial Action Objectives for arsenic and lead. For example, it is stated that it is not necessary to perform soil removals where arsenic Exposure Point Concentrations (EPCs) exceed 70 mg/kg but are lower than 240 mg/kg, or where lead exceeds 400 mg/kg but is less than 540 mg/kg in order to achieve protectiveness for the RME scenario. These statements appear to indicate that previous comments issued in 2002 on the Baseline Human Health Risk Assessment have not been addressed, e.g., concern over EPA's use of the current IRIS slope factor for arsenic, EPA's selection of the non-default GSD in the IEUBK model, and EPA's use of a 10 µg/dL blood lead level for children. EPA should note that the more stringent clean-up levels established by Alternative 6 are defensible based on a reasonable reassessment of the health risks presented in the Baseline Human Health Risk Assessment.*

EPA does not agree that the concerns raised previously and reiterated here constitute a basis for concluding that the original action levels would not be protective of human health. Please see response to comments 16 and 18 on the May 2002 Proposed Plan.

16. *In the Feasibility Study Report Addendum of December 20, 2002, EPA states that abatement of exterior lead-based paint would be performed under this program if soils at a property are remediated and paint abatement is required to protect the remedy. However, the preferred remedy in the Proposed Plan should discuss how provisions would be made to coordinate paint abatement with soil abatement. It should also provide an option for residents to conduct abatement of interior lead paint (e.g., using non-EPA funds) at the same time as their home's exterior paint and soil are being remediated. Allowance for a coordinated approach would greatly facilitate an overall reduction in lead risk in OU1 of the VB/I-70 Site. The preferred remedy in the Proposed Plan should provide greater emphasis on how such abatement will be encouraged. The budget for the preferred remedy should also reflect allowances for assessment of exterior lead*

paint risk, and for remediation in some cases.

Through the Community Health Program, EPA will coordinate with other federal, State, or local agencies that can provide funding and/or conduct lead paint abatement on the exterior of homes concurrent with soil removal. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

The following individuals addressed EPA at the public meetings in order to be recognized as a concerned citizen and/or member of a concerned organization.

Jesus Mendez	Clayton Cole Healthy Children Partnership
Amalio Bayan	Clayton Cole Healthy Children Partnership
Ricardo Guerrero	Clayton Cole Healthy Children Partnership
Nefertiti Kiel	Clayton Cole Healthy Children Partnership
Michael Waheside	Clayton Cole Healthy Children Partnership
Victoria Castille	Clayton Cole Healthy Children Partnership
Brisa Bayan	Clayton Cole Healthy Children Partnership
Jasmine Jusch	Clayton Cole Healthy Children Partnership
Janette	Clayton Cole Healthy Children Partnership
Kian Kelky	Clayton Cole Healthy Children Partnership
Dominique Hope	Clayton Cole Healthy Children Partnership
Liset Mendez	Clayton Cole Healthy Children Partnership
Joshua Beasui	Clayton Cole Healthy Children Partnership
Vicentio Mendez	Clayton Cole Healthy Children Partnership
Marisol Vasquez	Clayton Cole Healthy Children Partnership
Irving Bayan	Clayton Cole Healthy Children Partnership
Jordan Hope	Clayton Cole Healthy Children Partnership
Euzard Jackson	Clayton Cole Healthy Children Partnership
Ira Moran	Clayton Cole Healthy Children Partnership
Christopher Kiel	Clayton Cole Healthy Children Partnership
Paloma Gonzalez	Clayton Cole Healthy Children Partnership
Angelo Brown	Clayton Cole Healthy Children Partnership
Dominique Brian	Clayton Cole Healthy Children Partnership

2.2 Technical and Legal Issues

All excavated soils will be transported to a local solid waste landfill where they may be used as daily cover material. Alternatively, soils could be placed at the ASARCO Globe Plant Site to be used as cover and grading consistent with the provisions of the Statement of Work as set forth in the Final Consent Decree pursuant to State of Colorado vs. ASARCO, Civ. Action No. 83-C-2383 or as otherwise approved by the State. This facility may be off-site or may be the ASARCO Globe Plant. For purposes of this remedial action, and consistent with Section 300.400(e)(1) of the NCP, EPA may determined that the ASARCO Globe Plant is a suitable area in very close proximity to the contamination, which is necessary for the implementation of the response action. Further, since EPA notes that the ASARCO Globe Plant and the adjacent VB/I-70 OU1 neighborhoods are "reasonably related on the basis of geography", and since "the basis of threat or potential threat to the public welfare or welfare of the environment" are similar (i.e., smelter wastes containing, among other constituents, arsenic and lead), EPA has elected to treat the contiguous ASARCO Globe Plant as part of the VB/I-70 site for remediation purposes. Accordingly, a permit is not required for EPA to dispose of residential soil removed from yards within the Cole, Clayton, Swansea, or Elyria neighborhoods at the ASARCO Globe Plant. See, CERCLA Section 121(e). EPA also notes that depositing the VB/I-70 residential soils at the ASARCO Globe Plant will be protective of human health and the environment, will comply with all ARARs for the remedy selected at VB/I-70 OU1, and will accelerate the cleanup at that portion of the ASARCO Globe Site. Lastly, EPA believes disposal of the VB/I-70 residential soil at the ASARCO Globe Plant will enhance its prospects for future reuse as a commercial or recreational facility. Land use restrictions and/or controls will be imposed on the ASARCO Globe Plant to ensure that the soils deposited there as part of this cleanup will not pose a future risk in the event the Plant's current land use changes. The State's concurrence is contingent upon acceptance of the plan by the Globeville community. The State will be the lead agency for the soil placement and remediation of the ASARCO Globe Plant Site.

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